



**RELEASE ABATEMENT MEASURE
COMPLETION REPORT AND
PERMANENT SOLUTION STATEMENT**

**RTNS 3-36184 & 3-23606
515 SOMERVILLE AVENUE**

SOMERVILLE, MASSACHUSETTS

DECEMBER 29, 2021

Prepared For:

Massachusetts DEP
Northeast Regional Office
205B Lowell Street
Wilmington, MA 02150

On Behalf Of:

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PROJECT NO. 6735



December 29, 2021

Massachusetts DEP
Northeast Regional Office
205B Lowell Street
Wilmington, MA 02150

Attention: Bureau of Waste Site Cleanup

Reference: 515 Somerville Avenue, Somerville, Massachusetts;
Release Abatement Measure (RAM) Completion Report and Permanent
Solution Statement with Conditions; RTNs 3-36184 & 3-23606

Ladies and Gentlemen:

Enclosed herewith is a RAM Completion Report for RTNs 3-36184 and 3-23606, which are associated with the 515 Somerville Avenue property located in Somerville, Massachusetts (subject site). As a result of the RAM Completion, a Permanent Solution with Conditions was achieved for RTN 3-36184 which is further documented in this report. The status of RTN 3-23606 for which a Permanent Solution was filed by the previous owner in 2011 remains unchanged. Refer to the Project Location Plan (**Figure 1**) for the general site locus.

This report has been prepared on behalf of YEM Somerville Ave, LLC, which is an Eligible Person as that term is defined in M.G.L. Chapter 21E. These services are subject to the limitations in **Appendix A**.

Fronting onto Somerville Avenue to the south, the approximate 47,000 square-foot subject site is bounded by Laurel Street to the east, residential properties to the north and northwest, and commercial properties to the southwest. Currently, the subject site is an active construction site, the perimeter of which is fenced.

Redevelopment of the subject site has been ongoing over the past 1.5 years and is nearing completion. The scope of redevelopment has included the construction of an approximately 6-story hotel building with a footprint of approximately 22,000 square feet occupying the southern portion of the subject site. The lowest level of the building consists of a ventilated below-grade parking garage that is accessed via a ramp which was constructed at the northwestern side of the building. A driveway and asphalt paved parking lot have been constructed adjacent to the northern and western ends of the building. Upon completion of the building interior, the first floor will consist of a fitness center, pool, meeting room, lobby, and a restaurant. The upper five floors will mainly consist of guest rooms. Although not yet completed, landscaped margins will occupy the remainder of the subject site.

The release of PCBs, to which RTN 3-36184 was initially assigned, was encountered at the eastern portion of the subject site during assessment activities that were completed prior to the commencement of construction in March 2020. A subsequent release of petroleum hydrocarbons was encountered during the removal of an underground storage tank (UST) at the northwestern portion of the subject site which was later linked with RTN 3-36184.



In addition, historical releases of oil and hazardous material have been previously reported at the subject site by the former owner which have achieved Permanent Solutions under the MCP. In particular, a Class A-3 Response Action Outcome (RAO) Statement was submitted to the DEP by the previous site owner for a release of asbestos containing material (ACM) in soil to which RTN 3-23606 was assigned. In order to maintain a Condition of No Significant Risk, an Activity and Use Limitation (AUL) was implemented at the northwestern portion of the subject site to maintain a thickness clean soil cover and to restrict disturbance of the underlying ACM affect soil.

During redevelopment of the subject site, a RAM was completed which involved the excavation and off-site removal of soil that was affected by the releases of PCB and petroleum hydrocarbons. At the eastern portion the subject site, excavation to construct the below grade parking garage and building foundations resulted in the off-site removal of all fill material and natural soil to a depth of about 12 feet below ground surface. The excavation of the access ramp and subsurface utilities at the northwestern portion of the subject site also resulted in the removal of all fill material and natural soil to a depth ranging from approximately 12 to 15 feet. In addition, a separate remedial excavation was performed after the removal of the former UST which extended to approximately 15 feet below ground surface. Within the area of the AUL, the upper 1-foot of clean cover soil was replaced with clean densely graded fill material and asphalt pavement.

In summary, the results of the above referenced RAM activities have achieved a Permanent Solution for RTN 3-36184. A Method 3 Risk Characterization was performed which conservatively used the maximum and 95th Upper Confidence Limit of residual concentrations of the contaminants of concern remaining in soil. The results of the Method 3 Risk Characterization indicate that a Condition of No Significant Risk exists to human health, safety and welfare and to the environment at the RTN 3-36184 site.

The current status of RTN 3-23606 for which a Class A-3 RAO Statement was filed in 2011 remains unchanged. The obligations and conditions as well as the permitted uses of the AUL remain necessary to maintain an adequate thickness of clean soil covering the area affected by ACM and to restrict the management and handling of the ACM affected soil at the northwestern portion of the subject site.

A representativeness and data usability evaluation were conducted in accordance with 310 CMR 40.1056(2)(k). In summary, the data are considered to be of acceptable accuracy, precision, and sensitivity. The analytical data used to support the Permanent Solution were generated pursuant to the Department's Compendium of Analytical Methods (CAM). The validity and defensibility requirements of the analytical data used to support the findings of the Permanent Solution for this disposal site have been satisfied.

Based upon the results of the RAM and a Method 3 Risk Characterization, a Permanent Solution with Conditions has been achieved and a Condition of No Significant Risk exists for current and future use of the RTN 3-36184 site. Although located beneath the access ramp to the below garage and/or at a depth of about 12 feet below ground surface, residual levels of the contaminants of concern may hypothetically pose a Risk during the cultivation of



Massachusetts DEP
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fruits and vegetables for human consumption. As a result, and pursuant to Section 40.1013(a) of the MCP, the Permanent Solution that has been achieved for the RTN 3-36184 site includes the following Limitations, Assumptions and Conditions that do not require an AUL; the implementation of best management practices for gardening at the site which are based upon the US EPA and the Draft Article 89 of the Boston Zoning Code, which are included as an appendix to this report.

We trust that the information contained herein is sufficient to support the RAM Completion Report and Permanent Solution Statement with Conditions for the MCP site to which RTN 3-36184 applies. Please call with any questions.

Sincerely,

McPHAIL ASSOCIATES, LLC

William J. Burns, L.S.P.

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PURPOSE AND SCOPE The purpose of this report by McPhail Associates, LLC (McPhail) is to provide the supporting data and associated information for the submittal of a Release Abatement Measure (RAM) Completion Report for Release Tracking Numbers (RTNs) 3-36184 and 3-23606, which are associated with the 515 Somerville Avenue property in Somerville, Massachusetts (subject site). As a result of the RAM Completion, a Permanent Solution with Conditions was achieved for RTN 3-36184 which is further documented in this report. Refer to the Project Location Plan, **Figure 1**, for the general site locus.

This report was prepared in accordance with the authorization of YEM Somerville Ave, LLC and is subject to the limitations in **Appendix A**.

This report was prepared in accordance with the Massachusetts Oil and Hazardous Materials Release Prevention and Response Act (MGL Chapter 21E) and the Massachusetts Contingency Plan (310 CMR 40.0000).

PARTY PERFORMING RESPONSE ACTIONS YEM Somerville Ave, LLC has performed response actions at the MCP disposal sites as an Eligible Person in accordance with the provisions of Chapter 21E and the MCP (310 CMR 40.0170). Mr. Jordan Warshaw is listed on the electronically submitted BWSC forms as the Authorized Signatory in connection with this submittal. Please note that Jordan Warshaw is electronically signing the BWSC forms as Authorized Signatory for YEM Somerville Ave LLC, and not individually.

The contact information is as follows:

YEM Somerville Ave, LLC
425 Boylston Street
Boston, MA 02116

Contact: Mr. Jordan Warshaw, Authorized Signatory
Tel: 617-851-9995

GENERAL DISPOSAL SITE INFORMATION Fronting onto Somerville Avenue to the south, the approximate 47,000 square-foot subject site is bounded by Laurel Street to the east, residential properties to the north and northwest, and commercial properties to the southwest. Currently, the subject site is an active construction site, the perimeter of which is fenced.



Redevelopment of the subject site has been ongoing over the past 1.5 years and is nearing completion. The scope of redevelopment that has been completed thus far includes the construction of an approximately 6-story hotel building with a footprint of approximately 22,000 square feet occupying the southern portion of the subject site. The lowest level of the building consists of a ventilated below-grade parking garage that is accessed via a ramp which was constructed at the northwestern side of the building. A driveway and asphalt paved parking lot have been constructed adjacent to the northern and western ends of the building. Upon completion of the building interior, the first floor will consist of a fitness center, pool, meeting room, lobby, and a restaurant. The upper five floors will primarily consist of guest rooms. Landscaped margins will occupy the remainder of the subject site.

Ground surface surrounding the subject building is generally level and is located at approximately Elevation +24. The top of the floor slab associated with the ventilated below grade parking garage that occupies the entire footprint of the subject building is located at approximately Elevation +15.

The release of PCBs, to which RTN 3-36184 was initially assigned, was encountered at the eastern portion of the subject site during assessment activities that were completed prior to the commencement of construction in March 2020. A subsequent release of petroleum hydrocarbons was encountered during the removal of an underground storage tank (UST) at the northwestern portion of the subject site which was later linked with RTN 3-36184.

In addition, historical releases of oil and hazardous material have been previously reported at the subject site by the former owner which have achieved Permanent Solutions under the MCP. In particular, a Class A-3 Response Action Outcome AO Statement was submitted to the DEP by the previous site owner for a release of asbestos containing material (ACM) in soil to which RTN 3-23606 was assigned. In order to maintain a Condition of No Significant Risk, an Activity and Use Limitation (AUL) was implemented at the northwestern portion of the subject site to maintain a thickness clean soil cover and to restrict disturbance of the underlying ACM affect soil.

The limits of the subject site boundaries of the RTNs 3-36184 and 3-23606 which correspond to the area subject to the RAM and Permanent Solution Statement are shown on **Figures 2** through **4**.



SITE AND REGULATORY HISTORY

A detailed discussion of site history and the associated regulatory background is contained in the MCP reports that were previously submitted to the DEP for RTNs 3-36184 and 3-23606. The following is an abbreviated description of relevant site history and regulatory background information for reference.

Site History

The subject site consisted of a vacant parcel of land from 2009 until the commencement of its redevelopment in March 2020. Prior to this time period, a single-story commercial/light industrial building had occupied the central portion of subject site for approximately 90 years. According to MCP reports prepared by others for the historical releases assigned to the subject site, the former commercial/light industrial building was constructed in 1924 and was initially occupied by an automotive repair shop that also dispensed gasoline. By 1950, the former building was occupied by the Eastern Overall Company, a uniform supply and cleaning company. In 1972, John Solomon, Inc. acquired the commercial building for textile manufacturing which included cutting and seaming of textile materials. Reportedly, John Solomon, Inc. ceased its operations and vacated the premises in 2002.

From 2002 to 1972, the western portion of the site was predominately occupied by a loading dock and storage area that supported the former building. Prior to 1972, the western portion of the site was generally undeveloped.

The eastern portion of the subject site was initially developed in the late 1800's by multi-family residential buildings which were demolished during the 1980's. Subsequently, the residential properties were repurposed as an asphalt paved parking lot for the employees of the commercial/light industrial building.

Regulatory History

Historical Releases

Prior to its redevelopment, subsurface assessment activities were completed by the previous site owner which identified releases of oil and/or hazardous materials at the subject site. These releases were assigned RTNs 3-23606, 3-28548, 3-28546, 3-28545 and 3-04350, each of which has achieved a Permanent Solution under the MCP. While a majority of the historical releases were attributable to historical filling as well as former USTs which have since been removed off-site, a release of ACM was identified in soil



located adjacent to the northwestern side of the recently constructed building. According to MCP reports prepared for the historical releases, the previous site owner had excavated and removed off-site up to five (5) USTs which had contained gasoline, fuel oil and Stoddard solvent, as well as contaminated soils which had surrounded the former USTs.

While some of the ACM affected soil was excavated and removed off-site as part of MCP response actions, the remaining ACM was covered by a 3-foot layer of clean soil and an AUL was recorded for the localized area at the northwestern portion of the subject site. The AUL restricts the management and handling of the ACM impacted soil as well as maintains the thickness of clean soil covering the area affected by ACM at the northwestern portion of the subject site.

RTN 3-36184

In November 2019, subsurface assessment activities that were performed by others in November 2019 identified Reportable Concentrations of PCBs in fill material at the eastern portion of the subject site. Further assessment of the release indicated that the release of PCBs was localized to the eastern portion of the subject site at a depth range of 0 to 9 feet below ground surface. A Release Notification Form for the PCB release was submitted to the DEP on March 4, 2020, to which Release Tracking Number (RTN) 3-36184 was assigned.

On June 23, 2020, an UST was encountered during excavation activities at the northwestern portion of subject site on June 23, 2020. Upon removal of the tank on July 9, 2020, the results of subsequent headspace screening of soil samples that were obtained from the limits of the tank grave triggered a 72-hour condition to which RTN 3-36373 was assigned. Subsequently, the DEP approved an IRA which included the off-site removal of contaminated soil that may be present within the UST grave.

On July 9, 2020, the subject site was informed by DEP that implementation of Public Involvement activities is required pursuant to Sections 40.0447 and 40.1405 of the MCP. According to discussions with the DEP, Public Involvement activities were required given that the historical RTN 3-23606 was designated as Public Involvement Plan (PIP) site in 2005. Although Section 40.1405(7)(a) indicates that designation of a PIP site shall terminate following implementation of the PIP activities applicable to a Permanent Solution Statement, which was filed in 2011 for



RTN 3-23606, the DEP has specified Public Involvement activities were required.

In accordance with the provisions of Section 40.1404(9) of the MCP, a public meeting for those listed on the September 2005 PIP mailing list was held on August 11, 2020, to provide an opportunity to ask questions and comment on the information contained in the previously submitted Immediate Response Action (IRA) Plan dated July 24, 2020.

After expiration of the public comment period, contaminated soil was excavated and removed off-site in October 2020. Subsequently, assessment activities were performed which included the analysis of soil and groundwater from the limits and within the immediate of the IRA excavation. Based upon the results of the assessment activities, conditions at the site were considered stable and an Imminent Hazard, Critical Exposure Pathway or a Condition of Substantial Release Migration were not present at the RTN 3-36373 site. As a result, an IRA Completion Report was submitted to the DEP in May 2021 linking the IRA RTN 3-36373 site with RTN 3-36184.

SUBSURFACE CONDITIONS

Set forth below is a discussion of the generalized subsurface conditions across the site which are inferred primarily from the borings and the test pits performed at the subject site but also from our knowledge of the geology of the local area. Boring and test pit logs prepared for these explorations were included in the previously submitted RAM Plan.

Prior to its redevelopment, a 5 to 9-foot thickness of granular fill material covered the entire area of the subject site. The fill material generally consists of a loose to very dense, light brown to black, sand with some silt varying to a well-graded mixture of silt, sand and gravel. In order to construct the foundation and below-grade ventilated parking garage, a majority of the fill material was excavated and removed off-site. The small amount of fill material that is remaining at the site is located adjacent to the north of the existing building and is covered by asphalt pavement or by landscaping.

The foundation of the building and the parking level slab are located on top of a natural glacial outwash deposit consisting of a loose to compact, light brown to gray, fine to medium sand with trace to some silt. Explorations that were previously completed at



the site indicate that the glacial outwash deposit extends to approximately 19 to 29 feet below ground surface.

The natural glacial outwash is underlain by discontinuous deposits of marine clay and glaciomarine soil. The marine clay deposit consists of a firm, gray clay with trace silt and occasional fine sand partings. The glaciomarine deposit consists of a firm to hard, light brown to gray, silty sandy clay, with some gravel.

Hydrogeology

Groundwater was observed at depths of 9.9 and 9.7 feet below ground surface, which correspond to Elevation +15.0 and Elevation +15.2, respectively. According to MCP reports prepared by others, groundwater flows in a southerly direction at the subject site towards Somerville Avenue.

It is anticipated that future groundwater levels across the site may vary from those reported herein due to factors such as normal seasonal changes, periods of heavy precipitation, and alterations of existing drainage patterns.

RELEASE ABATEMENT MEASURES COMPLETED

On March 17, 2020, a construction RAM Plan was submitted to the DEP for RTN 3-36184 and the historical RTN 3-23606 to which an AUL applies. With respect to RTN 3-36184, the objective of the RAM was to excavate and manage the off-site disposal of fill material which has been affected by the release of PCBs during redevelopment of the subject site. The RAM Plan also included the management of the clean soil cap that covers ACM soil at the northwestern portion of the site which is located outside the proposed building footprint. Finally, the RAM Plan included contingencies for encountering unanticipated affected soils and USTs or other similar containers.

Performance of the RAM excavation was monitored by a McPhail Associates representative who performed air monitoring at the subject site perimeter for dust, monitored segregation of excavated fill materials affected by the release and maintained records of the remedial activities. The monitoring of ambient air during performance of the RAM did not detect concentrations of dust which exceeded the actions levels documented in the RAM Plan.

The following is a summary of RAM activities that were completed at the subject site. The Release Abatement Measures that were



completed prior to July 2021 have been discussed in further detail in RAM Status Reports that were previously submitted to the DEP in July 2021, January 2020, and July 2020.

- Excavation related to the planned construction at the site commenced shortly after the submittal of the RAM Plan in March 2020. As referenced above, excavation to construct the building foundation has been completed which included the off-site removal of all soil within and adjacent to the building footprint to a depth ranging from approximately 10 to 12 feet below ground surface.

As documented in the July 2020 RAM Status report, excavation to construct the building foundation has resulted in the off-site removal of all fill material that was affected by the Reportable Concentrations of PCBs to which RTN 3-36184 has been assigned. Specifically, the existing fill material within the entire area of Cell 10 was excavated to a depth ranging from approximately 10 to 12 feet below ground surface. Upon its excavation, the PCB affected fill material was directly loaded onto trucks and transported to the Waste Management Turnkey Landfill in Rochester, New Hampshire.

In addition to the RAM excavation of PCB affected fill material, other fill material and natural soil that was affected by the Contaminants of Concern associated with RTN 3-23606 were removed off-site as part of post-Permanent Solution remedial actions pursuant to Section 40.1067(3) of the MCP. This fill material and natural soil exhibited similar concentrations of polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, VOCs and metals as those utilized to evaluate a Condition of No Significant Risk in the RAO Statement that was filed for RTN 3-23606 in 2011. In accordance with the Soil Management Plan that was prepared for the project site, the affected fill material and natural soil was removed to Lynn Landfill (an unlined landfill), Ondrick Materials and Recycling LLC (an asphalt batch plant) and the above referenced Turnkey Landfill under a BOL pursuant to Section 40.0032 of the MCP.

In addition, in-situ TCLP lead stabilization treatment on fill material located within Cells 10 and 15 at depths ranging from 0 to 6 feet below ground surface. Upon completion of the stabilization treatment, eighteen (18) post-remediation



samples of the treated fill material were submitted by the Contractor for TCLP lead analysis. The results indicated that concentrations of TCLP lead in the samples analyzed were below 5 mg/l, and therefore the fill material was considered non-hazardous material for off-site disposal.

- Preparation of the AUL area for the construction of a proposed parking lot was completed during August and September 2021. As part of the work, the upper 1-foot of clean soil covering the area of the AUL was excavated and replaced by a clean dense grade material from an off-site source. Subsequently, approximately 3-inches of asphalt pavement was placed over the dense-graded material and thus covering the area of the AUL.
- On June 23, 2020, a UST was encountered during excavation activities at the northwestern portion of subject site on June 23, 2020. Upon removal of the tank, the results of subsequent headspace screening of soil samples that were obtained from the limits of the tank grave triggered a 72-hour condition to which RTN 3-36373 was assigned which has since been linked with RTN 3-36184.

After the expiration of the public comment period on October 14, 2020, the IRA Plan associated with recently linked RTN 3-36373 was implemented at the northwestern portion of the subject site. As part of this IRA, approximately 25 cubic yards of contaminated soil were excavated and removed off-site to the Ondrick asphalt batch plant in Chicopee, Massachusetts. The IRA excavation generally measured approximately 30 feet by 12 feet and extended to Elevation +10.

Upon excavation of the petroleum contaminated soil, samples of soil were obtained from the limits of the IRA. Soil samples that were obtained from the southern, eastern, western northern and bottom of the IRA excavation were submitted for laboratory analysis for the presence of volatile petroleum hydrocarbon (VPH) fractions and target volatile organic compounds (VOCs). Subsequently, the IRA excavation was backfilled with flowable fill and clean fill material from an off-site source.



Remediation Waste Management

A total of approximately 1,241.39 tons (757 cubic yards) of PCB contaminated fill material were transported off-site to WM-Turnkey Recycling and Environmental Enterprises (TREE) in Rochester, New Hampshire. As a result, the PCB contaminated fill material that is subject to RTN 3-36184 was removed off-site.

A total of approximately 7,178.25 tons (4,486 cubic yards) of fill material and natural soil, which met the criteria for reuse at an in-state unlined landfill were transported to the Lynn Landfill in Lynn, Massachusetts. In addition, approximately 1,280.10 tons (800 cubic yards) of fill material and natural soil which met the criteria for recycling at an asphalt batch plant was transported to Ondrick Materials & Recycling, LLC in Chicopee, Massachusetts. These materials were removed off-site pursuant to Section 40.067(3) of the MCP under a BOL as post-Permanent Solution remedial work related to RTN 3-23606.

In addition, as part of the IRA associated with the recently linked RTN 3-36373, a total of approximately 37.5 tons (25 cubic yards) contaminated soil were transported off-site to Ondrick Materials & Recycling asphalt batch plant in Chicopee, Massachusetts.

Environmental Monitoring

Environmental monitoring has been performed in accordance with the RAM Plan. To prevent exposures to the general public, on-site monitoring of dust and VOCs in the ambient air during the remedial excavation was performed by McPhail Associates, LLC. The monitoring for airborne particulates was performed utilizing a PDR portable dust monitor that collected dust levels along the perimeter of the RAM area. During each day of RAM excavation activities, continuous dust monitoring was performed along the perimeter of the subject site with a focus at the downwind portion of the site perimeter located near the work area. Dust monitoring was suspended during days of heavy precipitation and during saturated site conditions. The results of dust monitoring did not identify exceedances of the action level for dust that had been established in the RAM Plan. Dust monitoring reports were previously included in the July 2020 and January 2021 RAM Status reports.

Measurements of TVOC levels in ambient air were obtained along the perimeter of the project site utilizing a Mini-Rae 3000 Photo-ionization detector. The monitoring of TVOC in ambient air along



the site perimeter did not detect levels which exceed the action level established in the RAM Plan.

RAM FINDINGS AND CONCLUSIONS

In summary, the remedial goal of the RAM as it pertains to RTN 3-36184 was to achieve a Permanent Solution and a Condition of "No Significant Risk" and, thus, facilitate filing of a Permanent Solution Statement.

As further documented in the following sections of this report, fill material exhibiting levels of PCBs in excess of the applicable Method 1 S-1 risk characterization standards has been removed from the MCP site. In addition, the removal of petroleum affected soil located within the vicinity of the former UST at the northwestern portion of the site has resulted in a Condition of No Significant Risk. Accordingly, a Permanent Solution has been achieved as well as the remedial goal of the RAM.

With respect to RTN 3-23606, the upper portion of the clean soil covering the ACM affected soil was replaced with a clean dense graded material and asphalt pavement for a proposed parking lot. The ACM affected material underlying the clean soil was not disturbed and obligation and conditions of the AUL remain unchanged.

No additional or on-going response actions are anticipated under the RAM.

IDENTIFICATION OF SOURCE AND EXTENT OF RELEASE

Conceptual Site Model

The contaminants of concern that have been identified in soil during pre-characterization activities at the RTN 3-36184 site include PCB aroclors 1242 and 1254. During RAM excavation activities, a release of volatile petroleum hydrocarbons (VPH) was identified in soil within the immediate vicinity of a formerly unknown UST.

Although a specific source has not been identified, the presence of PCBs is considered attributable to the historical filling the subject site. As referenced above, the eastern portion of the subject site was historically occupied by residential houses that were constructed during the late 1800s. The residential structures were demolished in 1980's and the area was covered by an asphalt paved parking lot that occupied the eastern portion of the subject site until 2009. The parking lot was removed in 2009 and



the area remained vacant until the recent redevelopment activities commenced in 2020.

The presence of VPHs is likely attributable to the historical storage of Stoddard solvents at the northwestern portion of the subject site. Although detected in the vicinity of the UST that was removed in July 2020, a previously reported historical release of VPHs in soil (RTN 3-04350) was identified by the previous owner in the same area of the subject site. As documented in a Class A-2 Response Action Outcome (RAO) that was submitted to the DEP on November 14, 1995 for RTN 3-04350, two (2) 5,000-gallon USTs previously containing fuel oil and Stoddard Solvent were removed from the northwestern portion of the subject site.

Subsurface assessment activities that were performed prior to the construction of the building indicate that the release of PCBs associated with RTN 3-36184 was localized to fill material at a depth range of 3 to 9 feet below ground surface. The area of the PCB affected fill material measured approximately 45-feet by 45-feet and was located at the eastern portion of the subject site. At the northwestern portion of the subject site, the release of VPH affected a 4-foot thickness extending from the bottom of tank that was located approximately 10 feet below ground surface. The area of soil affected by the release measured approximately 30 feet in length by 12 feet in width. The analysis of groundwater did not detect a release of contaminants of concern.

During construction of the building, soil that was affected by the releases of PCBs and VPH was excavated and removed off-site. At the eastern portion the subject site, excavation to construct the building's below grade parking garage and foundations resulted in the off-site removal of all fill material and natural soil to a depth of about 12 feet below ground surface corresponding to Elevation +12. The excavation of the ramp and subsurface utilities at the northwestern portion of the subject site also resulted in the removal of all fill material and natural soil to a depth of approximately Elevation +12. In addition, a separate remedial excavation was performed after the removal of the former UST which extended to approximately Elevation +10.

The results of the subsurface assessment activities that were performed prior to construction of the building as well as the results of post excavation soil testing were utilized in a Method 3 Risk Characterization and to demonstrate that a Permanent Solution was achieved for the release. Based upon the results of the Method 3 Risk Characterization, a Condition of No Significant



Risk exists for the current or future use of the release site. Based upon the remediation excavation activities that were completed at the release site, a Permanent Solution was achieved for the RTN 3-36184 site.

Extent of Release

The release of PCBs is localized to a 45-foot by 45-foot area of fill material located at the eastern portion of the subject site. The PCB affected fill material extended from a depth range of 3 to 9 feet below ground surface. The extent of the PCB release are defined by soil samples obtained from explorations TP-9A, TP-9, CP5W, CP-5N and CP-5S as well as post remedial samples Cell 10 Center, Cell 10 SE and Cell 10 NE. As referenced above, the soil representative of these samples has been excavated and removed off-site under the RAM Plan that was performed during construction of the building foundation and below grade level.

The release of VPH is localized to the vicinity of the former UST that was removed from the northwestern portion of the subject site. The VPH release affected a 4-foot thickness of soil located beneath the tank, the bottom which was encountered at approximately Elevation +14. The extent of the VPH release is defined by extent of the remedial excavation which measured approximately 12 feet in width and 30 feet in length. Soil limit samples that were obtained at the limits the remedial excavation as well as those that were obtained beyond the limits of the remedial excavation define the extent of the release.

Groundwater has not been affected by a release of the contaminants of concern.

Laboratory Analysis - Soil

The horizontal extent of the PCB and VPH release is depicted on **Figures 2** through **4** which corresponds to limits of the remedial excavations. The vertical extent of the release has been defined by the analysis of soil samples that were obtained at the bottom of the excavations at both release areas. The analytical results of soil samples that have been utilized to define the RTN 3-36184 site are summarized in **Table 2A, 2B** and **3**.

PCB Release

Laboratory testing performed on samples of fill material obtained by Clean Properties, Inc. and McPhail Associates, LLC from



surrounding explorations TP-9A, TP-9, CP-5, CP5W, CP-5N and CP-5S defined the limits of the PCB release to the west, south, and north as well as the vertical extent of the PCB contamination. Specifically, total PCB concentrations detected in samples obtained from these explorations ranged from none detected in excess of the laboratory reporting limits up to 0.5 milligrams per kilogram (mg/kg).

Additional, PCB analysis was performed on three (3) discrete samples of soil that were obtained from the bottom and sidewalls of the bulk excavation for the parking garage at approximately 10 and 7 feet below ground surface respectively. The analysis of soil samples identified as Cell 10 Center, Cell 10 SE and Cell 10 NE did not detect concentrations of PCBs in excess of the laboratory reporting limits which were set below the applicable Method 1 S-1 risk characterization standards.

VPH Release

In anticipation of the IRA, a series of soil samples were obtained from within and adjacent to the tank grave to evaluate the extent of contaminated soil requiring excavation and to pre-characterize the contaminated soil for off-site disposal. As discussed in the previously submitted IRA Completion Report for RTN 3-36373, the soil limit samples were submitted for the presence of EPH, target PAHs, VPH and target VOCs. In summary, the soil samples obtained from south and east of the tank grave exhibited concentrations of VPH which exceed the applicable Method 1 S-1 risk characterization standards. These samples were obtained from Elevations ranging from +12 and +11 which is below the bottom of the tank which had been removed off-site. The remaining samples, including the sample that was obtained from the base of the tank grave, did not exhibit concentrations of VPH, VOCs, EPH or target PAHs in excess of the applicable Method 1 S-1 risk characterization standards.

After completion of the IRA excavation, samples of soil were obtained from the northern, southern, eastern sidewalls and base of the excavation. Consistent with the samples obtained prior to the IRA excavation in July and August 2020, soil samples from the eastern and southern sidewalls of the IRA excavation exhibited the highest levels of TVOCs and a petroleum odor. Specifically, LS-101 (southern sidewall) and LS-102 (eastern sidewall) exhibited TVOC levels of 1054.9 ppm and 118.9 ppm respectively. With the exception of LS-101, the results laboratory analyses did not indicate concentrations of VPH or target VOCs in excess of the



applicable Method 1 S-1 standards. The sample LS-101 that was obtained from the southern limit of the IRA excavation at about Elevation +12 exhibited concentrations of VPH fractions C9-C10 aliphatics and C9-C12 aliphatics at 680 mg/kg and 3,450 mg/kg respectively. Concentrations of the remaining VPH and VOC constituents in this sample were detected below the applicable Method 1 S-1 standard.

On December 7, 2020, a subsurface exploration program was performed to evaluate potential impacts to groundwater from the RTN 3-36373 release and to further define its extent in soil. Specifically, monitoring well MA-1(OW) was installed adjacent to the IRA excavation and geoprobe MA-2 was installed to the south of the IRA excavation near southern boundary of the subject site.

In order to further define the extent of the release in soil, the soil sample exhibiting the highest TVOC concentration from MA-2 was submitted for laboratory analysis for the presence of petroleum constituents and volatile organic compounds (VOCs). As summarized on **Table 3**, the results of the laboratory analysis did not detect concentrations of VPH or EPH in excess of the applicable Method 1 S-1 risk characterization standards.

Laboratory Analysis - Groundwater

On December 17, 2019, groundwater samples were obtained by Clean Properties, Inc. from monitoring wells identified as West MW, and East MW, and submitted for laboratory analysis for parameters required by the Massachusetts Water Resources Authority (MWRA) to pre-characterize water in anticipation of off-site discharge which also include PCBs. The results of the laboratory analysis are summarized in a table prepared by Clean Properties, Inc. which is provided in **Appendix B** and also includes the associated laboratory data reports.

In summary, the results of the laboratory analysis did not detect concentrations of PCBs in excess of the applicable RCGW-2 reporting thresholds.

Furthermore, the analysis of soil samples located above the surface of groundwater has not detected concentrations of PCBs in excess of the laboratory reporting limits. As a result, a release of PCBs is not considered to be present in groundwater.

On December 11, 2020, a groundwater sample was obtained from monitoring well MA-1(OW) and submitted for laboratory analysis



for the presence VPH, target VOCs, EPH and target PAHs. As summarized on **Table 4**, the results of the laboratory analysis did not indicate concentrations of the tested constituents in excess of the applicable Method 1 GW-2 or GW-3 risk characterization standards. Further, the results of the groundwater testing are consistent with or lower than those that were historically reported by others at this portion of the subject site.

As a result, a release of VPHs is not considered to be present in groundwater.

ELIMINATION OF UNCONTROLLED SOURCES

Construction of the below grade parking garage as well as ramp and subsurface utilities has removed off-site a majority of the soil that was affected by the contaminants of concern. In addition, response actions that have been completed included the cleaning, removal and off-site disposal of a UST that was encountered at the northwestern portion of the subject site.

A specific source of PCBs has not been identified at the site and thus the release of PCBs is considered attributable to historically placed fill material. The presence of VPHs is likely attributable to the historical storage of Stoddard solvents at the northwestern portion of the subject site. Although detected in the vicinity of the UST that was removed in July 2020, the VPHs are likely attributable to two (2) former 5,000-gallon USTs containing fuel oil and Stoddard Solvent that were also removed from the northwestern portion of the subject site by the previous owner.

Based on the above information, all uncontrolled sources associated with the subject MCP site have been eliminated.

RISK CHARACTERIZATION

A Method 3 Risk Characterization for the MCP site was completed by by McPhail Associates, LLC to conservatively assess current and unrestricted future use of the MCP site utilizing the DEP Shortforms in accordance with the MADEP Shortform User's Guide dated March 2015 and applicable provisions of the MCP. There were no modifications made to the applicable Shortform Risk Characterization worksheets. A copy of the Shortform Risk Characterization calculation tables is included in **Appendix C**.

Specifically, the Method 3 Risk Characterization was performed to evaluate residual levels of the contaminants of concern in soil at the RTN 3-36184 site. The Risk Characterization addressed the potential risk of harm to human health, safety, public welfare and



to the environment for both current use and future site use. In conservatively assessing the potential risks associated with future unrestricted use of a site, the future use of the subject site as a single family residential home was evaluated.

We note that the area of the RTN 3-36184 site is covered by the below grade parking garage, access ramp and foundations of the new hotel building that is currently under construction at the subject site. Additionally, future redevelopment of the subject site for the construction of single-family homes within this highly urbanized area of Somerville is unlikely. However, the single-family residential scenario was conservatively evaluated as part of the Method 3 risk characterization in consideration of unrestricted future site use.

Contaminants of Concern

The contaminants of concern associated with RTN 3-36184 are considered to be PCBs and VPHs that have affected localized areas of soil at the eastern and northwestern portions of the subject site, respectively.

The analysis of groundwater has not detected concentrations of the contaminants of concern in excess of the applicable RCGW-2 reporting thresholds.

Derivation and Evaluation of Exposure Point Concentrations

As a conservative measure, the exposure point concentrations (EPCs) for soil were determined by utilizing the maximum concentrations of PCBs and the 95th Upper Confidence Limits (UCL) for concentrations of individual VPH fractions. The EPCs were calculated to evaluate the potential risks for individuals who may come in contact with site soil including construction workers and building occupants.

However, as a more practical assessment of exposure risks at the MCP site, direct contact to fill material is restricted by the floor slab, ramp and foundations of the below grade parking garage. As a result, a direct exposure and ingestion exposure pathway is restricted at the RTN 3-36184 site.

The samples that were evaluated to derive the soil EPC and the EPC calculations are shown in **Tables 2A, 2B** and **3**. In summary, the EPC for each COC is as follows:



- Total PCBs 0.66 mg/kg
- C9-C10 aromatics 288.73
- C5-C8 aliphatics 14.65 mg/kg
- C9-C12 aliphatics 1,447.58 mg/kg

Groundwater was not affected by a reportable release of the COCs. Hence, development of EPCs for groundwater was not warranted.

Exposure Pathway

Potential receptors and exposure pathways at the RTN 3-36184 site are currently limited by the ventilated below grade parking garage, access ramp and foundations of the building which is currently being constructed at the project site. Furthermore, the perimeter of the subject site is surrounded by a chain-link fence limiting access to the subject site to construction personnel. Once construction is complete, the building will be occupied as a hotel.

Direct contact with affected soil could occur to current or future construction workers involved in maintaining underground utilities or performing subsurface repairs. These workers could be exposed via dermal contact or incidental ingestion of affected fill material or via the inhalation of compounds that become entrained on airborne dust.

Direct contact with site soils under future conditions will be restricted by the floor slab of the below grade parking garage, ramp, and foundations of the building. Although unlikely, in order to evaluate unrestricted future site use and the possible need for an Activity and Use Limitation, the potential exposure pathways associated the future use of the subject site as a single-family residential home were evaluated.

Indoor Air as a Potential Exposure Pathway

Fill material affected by elevated levels of the COCs has been excavated and removed off-site as part of the RAM. The analysis of groundwater across the subject site has not detected concentrations of these constituents in excess of the applicable Method 1 GW-2 risk characterization standards. In addition, the area of the PCB release is covered by a ventilated below grade parking garage and the areas of the VPH release is covered by an open-air ramp that accesses the below grade parking garage. Therefore, as a result of the above, indoor air is not considered to be a potential exposure pathway at the MCP site.



Ecological Receptors

The ecological risk characterization evaluates potential risk to ecological receptors from exposure to contaminants on or migrating from the site. No environmentally sensitive areas are present at the MCP site. Hence, ecological risk is considered to be limited to the potential for migration of contaminants from the release site. The closest body of water is the Mystic River, which is approximately 1.3 miles to the east of the MCP site.

Given that the soil COCs are not considered to have affected groundwater, a Condition of No Significant Risk to ecological receptors is considered to exist with respect to the RTN 3-36184 site.

Risk Assessment Results

A Condition of No Significant Risk has been achieved under a Method 3 Risk Characterization when the cumulative receptor non-carcinogenic risk hazard index (HI) does not exceed 1 and the cumulative excess lifetime cancer risk (ELCR) is below the 1×10^{-5} .

Under the current and future site use scenarios described above and shown on the Shortform worksheets contained in **Appendix C**, the cumulative HI levels are less than 1. In addition, the cumulative ECLR is below 1×10^{-5} . Hence, we have concluded that a Condition of No Significant Risk has been achieved for the RTN 3-36184 site under all unrestricted current and future site conditions.

However, under the unlikely hypothetical scenario which involves cultivation of fruits and vegetables for human consumption within the areas of soil affected by the release, a potential Significant Risk may result from root uptake. Although this scenario would require demolition of the building foundation and floor slabs followed by the planting of produce 12 feet below ground surface, Best Management Gardening practices which involves raised planting beds would be required.

Characterization of Risk to Safety

In accordance with 310 CMR 40.0960, the risk of harm to safety must be characterized in a risk assessment. The site conditions are evaluated with respect to the criteria for safety included in the MCP:



- a. No rusted or corroded drums or containers, open pits, lagoons, or other dangerous structures were observed at or on the MCP Site.
- b. There is no present threat of fire or explosion.
- c. No uncontained material was identified at the MCP Site.

Based upon the above, a Condition of No Significant Risk of harm to safety based on current and reasonably foreseeable future land use is considered to exist at the MCP Site.

Background Evaluation

In accordance with the provisions of the MCP, and DEP's Final Policy, "Conducting Feasibility Evaluations under the MCP," Policy #WSC-04-160, the feasibility of approaching or achieving background contaminant levels at the subject site was evaluated. Background means those levels of oil and hazardous materials that would exist in the absence of the disposal site which are ubiquitous and consistently present in the environment at, and in the vicinity of, the disposal site of concern.

In evaluating the feasibility of reducing residual concentrations of PCBs as well as VPH fractions C9-C10 aromatics, C5-C8 aliphatics and C9-C12 aliphatics in soil to below background levels, the MCP broadly defines five specific criteria: availability of individuals with appropriate expertise, availability of off-site land disposal facilities, site access/control constraints (for off-property sources of contamination), technological feasibility, and an evaluation of cost to benefit.

The residual concentrations of PCBs that were utilized in the Method 3 Risk Characterization are well below the applicable Method 1 S-1 risk characterization standard. However, it should be noted that soil representative of the detectable PCB concentration was removed during construction of the building foundation, however, it was included to provide a conservative evaluation of risk. Therefore, pursuant to DEP's "Conducting Feasibility Evaluations under the MCP Policy" (Policy WSC-04-160), the release of PCBs is considered to be "Approaching Background".

Residual concentrations of VPH fraction C9-C10 aliphatics, a non-persistent compound, remain in soil below the access ramp at a depth of about 12 feet below ground surface. In accordance with DEP's "Conducting Feasibility Evaluations under the MCP Policy"



(Policy WSC-04-160), it is considered categorically infeasible to achieve background for a non-persistent contaminant.

As a result, further evaluation of the feasibility to achieve Background Conditions at the subject MCP site is not warranted.

DATA USABILITY ASSESSMENT

The representativeness and usability of the data were evaluated in accordance with 310 CMR 40.1056(2)(k) and are discussed below.

Sampling and Testing Rationale

Prior to construction, subsurface exploration programs were performed to pre-characterize soil in anticipation of site redevelopment and to assess the nature and extent of the identified contamination. Headspace screening results were also used to determine appropriate testing programs and to select appropriate analytical methods.

At the location of the UST, historical information indicated the storage and use of No. 2 fuel oil and Stoddard Solvents. Observations of stains, odors and headspace screening results were also used to determine appropriate testing programs and to select appropriate analytical methods.

Based upon the above and pursuant to the provisions of DEP Policy #WSC-02-411 entitled "Characterizing Risks Posed by Petroleum Contaminated Site: Implementation of the MADEP VPH/EPH Approach" the analysis of soil samples obtained from the immediate vicinity of the UST included VPH, target VOCs, EPH and target PAHs. The results of the assessment did not identify Reportable Concentrations of EPH or target PAHs but rather individual VPH fractions C9-10 aromatics, C5-C8 aliphatic and C9-C12 aliphatics. The analysis of groundwater did identify a release of VPH, target VOCs, EPH or target PAHs.

Number, Spatial Distribution, and Handling of Samples

Over 110 soil samples were collected from subsurface explorations located across the subject site as shown on **Figure 2**. Sampling locations were distributed across the subject site both horizontally and vertically. Within the area of the former UST that was removed from the northwestern portion of the subject site, a total of 13 soil samples were obtained from the limits of the tank grave as well as remedial excavation. Samples were submitted for analysis based on observations, headspace screening results as



well as to provide representative coverage of soils at the subject site. Headspace screening was performed in accordance with Attachment II to DEP's Interim Remediation Waste Management Policy for Petroleum Contaminated Soils, #WSC-94-400, "Jar Headspace Analytical Screening Procedures".

Groundwater samples were obtained from the selected observation wells at least 72-hours after installation and development. In order to ensure that each sample obtained from the observation wells was representative of groundwater at each location, at least 3 bore volumes of water were purged from each well utilizing a peristaltic pump at a low flow rate. Immediately upon achievement of the purged volume, a sample was obtained from the selected monitoring well.

Samples for laboratory testing were placed in laboratory-supplied sample containers appropriate for the analyses to be performed. Samples were placed on ice upon collection until they could be refrigerated, and the samples were transmitted to the laboratory under chain-of-custody protocols.

A field duplicate was not collected because the sampling was targeted toward the affected horizons and limits of contamination to give a representative assessment; therefore an assessment of variability was not considered necessary.

In addition, multiple subsurface assessment activities which includes the laboratory analysis of soil and groundwater were previously performed by others to evaluate the RTN 3-23606. Laboratory analysis that was performed included the contaminants of concern.

In summary, the number and targeted placement of analyzed samples is considered to be acceptable to support this Permanent Solution Statement.

Temporal Distribution of Samples

The release of PCBs in soil did not extend below surface groundwater. Furthermore, testing of groundwater for the presence of PCBs did not detect concentrations in excess of laboratory reporting limit. Thus, groundwater is not considered to be impacted by the release of PCBs.

The analysis of a groundwater sample that was obtained in December 2020 from a monitoring well located adjacent to the



former UST grave did not detect concentrations of VPH or EPH in excess of the applicable RCGW-2 reporting thresholds.

As part of the Permanent Solution that was filed by the previous owner for RTN 3-23606, in 2010 and 2011 several groundwater samples were obtained from multiple monitoring wells at the northwestern and western portions of the subject site. The samples were analyzed for the presence of VPH and EPH, the results of which did not detect concentrations in excess of the applicable Method 1 GW-2 or GW-3 risk characterization standards.

Given the above the above, no additional temporal groundwater sampling is considered necessary.

Completeness

No data gaps were identified in the sampling and analytical information used to support this Permanent Solution Statement. The information contained herein, and the number and locations of soil samples collected satisfy the objectives of the Permanent Solution Statement.

Inconsistency and Uncertainty

No inconsistencies or uncertainties were identified in the soil sample set used to support this Permanent Solution Statement. The visual/olfactory observations and headspace screening data were consistent with the laboratory analytical data.

Information Considered Unrepresentative

All soil samples are considered representative of soil conditions remaining at the MCP Site.

Data Usability

CAM Compliant data were used in support of the Permanent Solution and Method 3 Risk Characterization. Data considered to be CAM Non-Compliant, Non-CAM and Pre-CAM data were not relied upon for the Permanent Solution. The laboratory data sheets documented the use of analytical methods that are in accordance with applicable testing requirements. The laboratory reports contain a narrative that indicates compliance with the Presumptive Certainty status requirements contained in DEP Policy WSC-CAM. In addition, the laboratory narratives did not identify



non-compliance with the requirements contained in WSC-CAM. The validity and defensibility of the laboratory test data used in support of this Permanent Solution Statement regarding accuracy, precision and completeness are consistent with the requirements of Section 40.1056(2)(k) of the MCP.

As summarized in **Table 4**, the data is considered to be of acceptable accuracy, precision, and sensitivity. The analytical data used to support the Permanent Solution was generated pursuant to the Department's Compendium of Analytical Methods (CAM). The validity and defensibility requirements of the analytical data used to support the findings of the Permanent Solution Statement for the subject MCP site pursuant to 310 CMR 40.1056(2)(k) have therefore been satisfied.

PERMANENT SOLUTION STATEMENT

A Permanent Solution Statement with Conditions supported by a Method 3 Risk Characterization has been prepared for the MCP site to which RTN 3-36184 applies. Response actions have been completed at the MCP site and as a result a Condition of No Significant Risk exists for current and future use of the MCP site. An Activity and Use Limitation is not required to maintain a condition of No Significant Risk.

However, under the unlikely hypothetical scenario which involves cultivation of fruits and vegetables for human consumption within the areas of soil affected by the release, a potential Significant Risk may result from root uptake. Although this scenario would require demolition of the building foundation and floor slabs followed by the planting of produce 12 feet below ground surface, Best Gardening practices which involves raised plants would be required. As a result, and pursuant to Section 40.1013(a) of the MCP, the Permanent Solution that has been achieved for the RTN 3-29321 site includes the following Limitations, Assumptions and Conditions that do not require an AUL; the implementation of best management practices (BMPs) for gardening at the site which are based upon the US EPA and the Draft Article 89 of the Boston Zoning Code, which are enclosed **Appendix D**.

SUMMARY AND CONCLUSIONS

A RAM Completion Report has been prepared for RTNs 3-36184 and 3-23606 which are located at the 515 Somerville Avenue property in Somerville, Massachusetts. As a result of the RAM Completion, a Permanent Solution has been achieved and a Condition of No Significant Risk exists for RTN 3-36184. The



status of RTN 3-23606 for which a Class A-3 RAO Statement was filed by the previous owner in 2011 remains unchanged.

Redevelopment of the subject site has been ongoing over the past 1.5 years and is nearing completion. The scope of redevelopment has included the construction of an approximately 6-story hotel building, the footprint of which occupies the southern portion of the subject site. The lowest level of the building consists of a ventilated below-grade parking garage that is accessed via a ramp which was constructed at the northwestern side of the building. A driveway and asphalt paved parking lot have been constructed adjacent to the northern and western ends of the building. Landscaped margins will occupy the remaining exterior portions of the subject site.

The release of PCBs, to which RTN 3-36184 has been assigned, was encountered at the eastern portion of the subject site during the pre-characterization of in-situ soil that was completed prior to construction in March 2020. A subsequent release of petroleum hydrocarbons was encountered in July 2020 during the removal of a UST at the northwestern portion of the subject site. This release that was managed under an IRA was assigned RTN 3-36373 and was later linked with RTN 3-36184.

In addition, historical releases of oil and hazardous material have been previously reported at the subject site by the former owner which have achieved Permanent Solutions under the MCP. In particular, a Class A-3 RAO Statement was submitted to the DEP by the previous site owner for a release of ACM in soil to which RTN 3-23606 was assigned. In order to maintain a Condition of No Significant Risk, an AUL was implemented at the northwestern portion of the subject site to maintain a thickness clean soil cover and to restrict disturbance of the underlying ACM affect soil.

During redevelopment of the subject site, a RAM was completed which involved the excavation and off-site removal of soil that was affected by the releases of PCB and petroleum hydrocarbons. At the eastern portion the subject site, excavation to construct the below grade parking garage and building foundations resulted in the off-site removal of all fill material and natural soil to a depth of about 12 feet below ground surface. The excavation of the access ramp and subsurface utilities at the northwestern portion of the subject site also resulted in the removal of all fill material and natural soil to a depth ranging from approximately 12 to 15 feet. In addition, a separate remedial excavation was performed



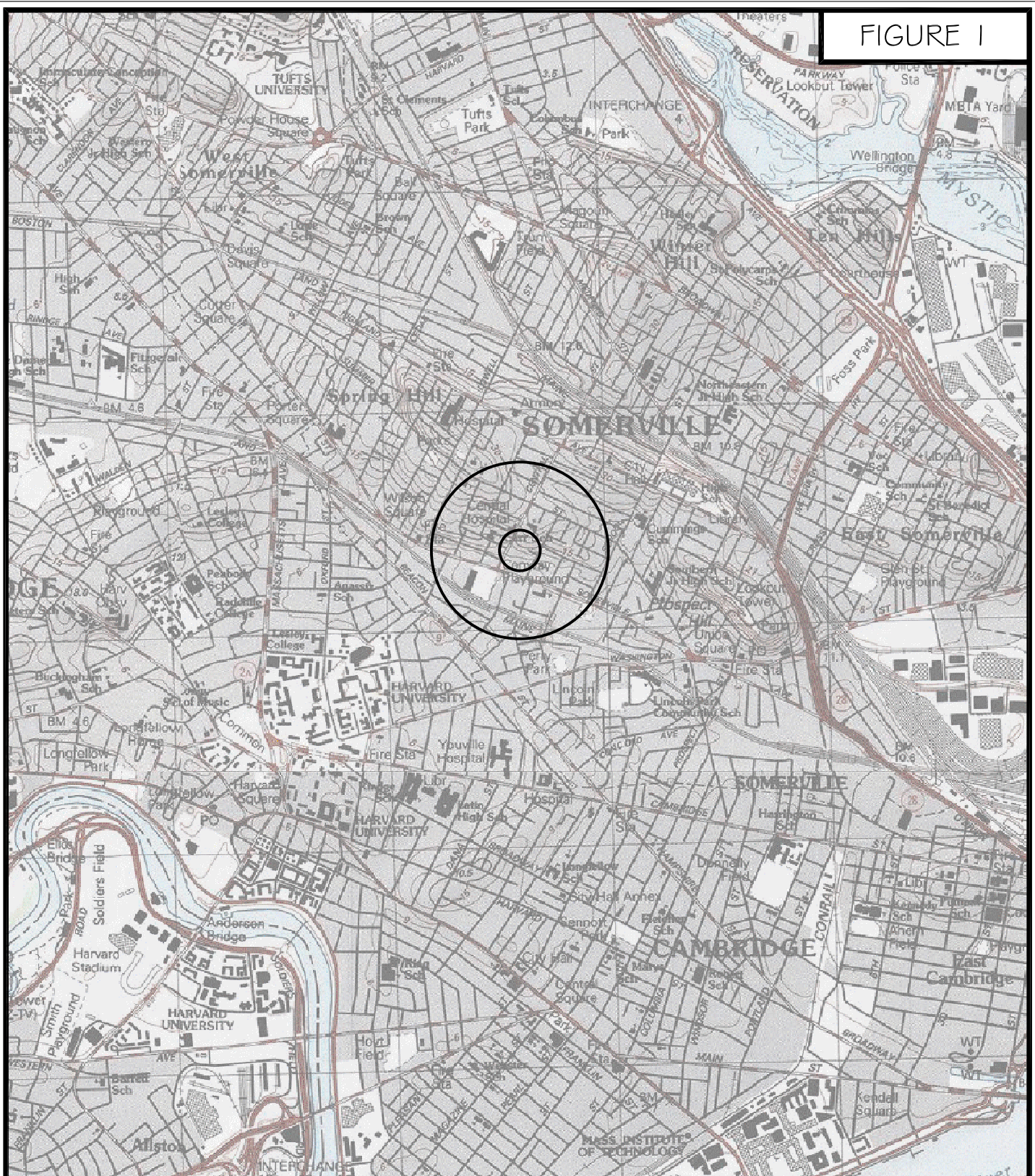
after the removal of the former UST which extended to approximately 15 feet below ground surface.

Within the area of the AUL, the upper 1-foot of clean cover soil was replaced with clean densely graded fill material and asphalt pavement. The obligations and conditions as well as the permitted uses of the AUL remain necessary to maintain an adequate thickness of clean soil covering the area affected by ACM and to restrict the management and handling of the ACM affected soil at the northwestern portion of the subject site.

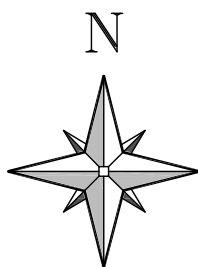
Based upon the results of the RAM and a Method 3 Risk Characterization, a Permanent Solution with Conditions has been achieved and a Condition of No Significant Risk exists for current and future use of the RTN 3-36184 site. Although located beneath the access ramp to the below garage and/or at a depth of about 12 feet below ground surface, residual levels of the contaminants of concern may hypothetically pose a Risk during the cultivation of fruits and vegetables for human consumption. As a result, Best Management Gardening practices which involve raised planting beds would be required.

A representativeness and data usability evaluation was conducted in accordance with 310 CMR 40.1056(2)(k). In summary, the data are considered to be of acceptable accuracy, precision, and sensitivity. The analytical data used to support the Permanent Solution were generated pursuant to the Department's Compendium of Analytical Methods (CAM). The validity and defensibility requirements of the analytical data used to support the findings of the Permanent Solution for this disposal site have been satisfied.

FIGURE I



Geotechnical and
Geoenvironmental Engineers
2269 Massachusetts Avenue
Cambridge, MA 02140
617/868-1420
617/868-1423 (Fax)
www.mcphailgeo.com



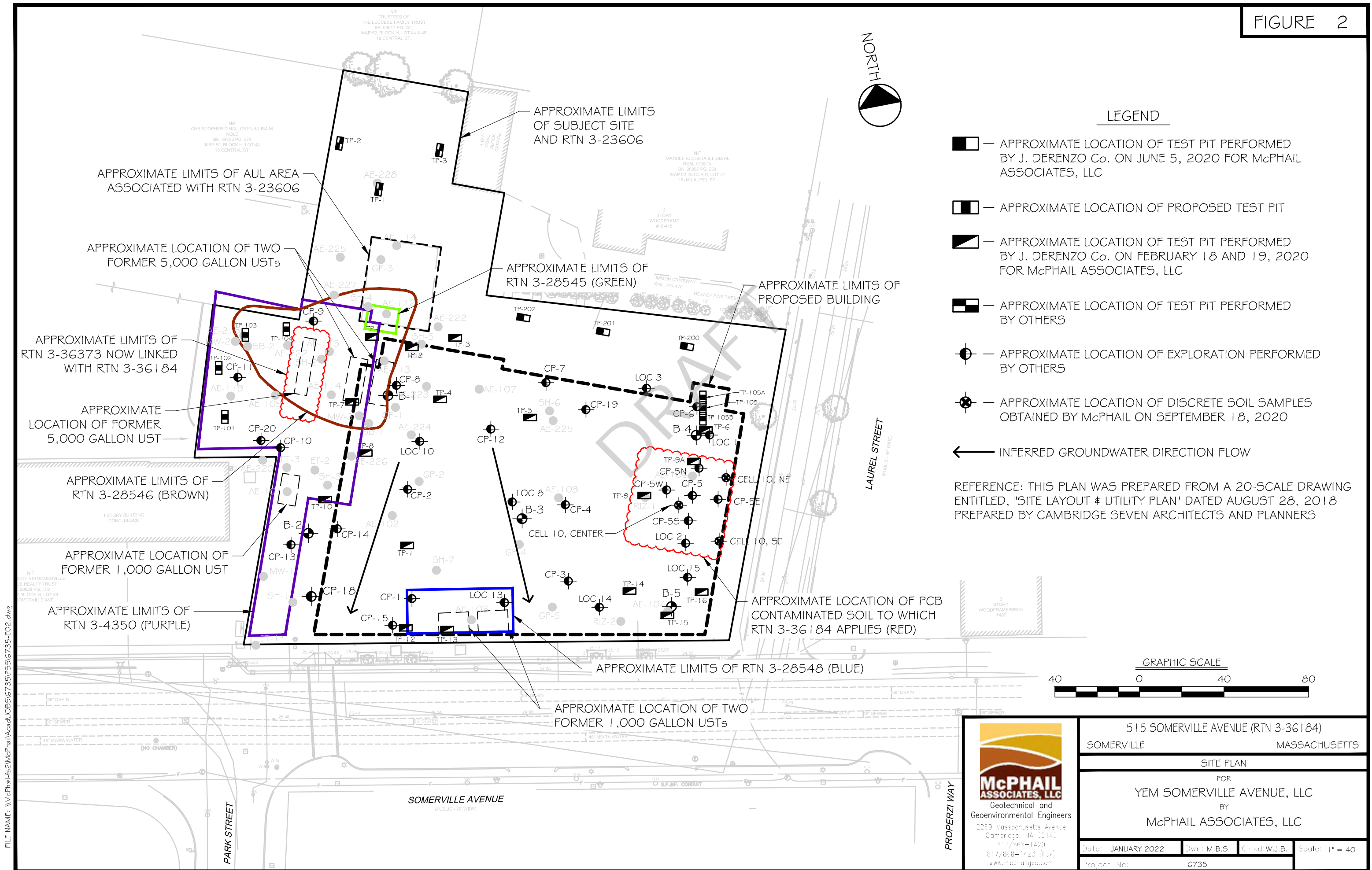
SCALE 1:25,000

PROJECT LOCATION PLAN

515 SOMERVILLE AVENUE




SOMERVILLE

MASSACHUSETTS





LEGEND

-  — APPROXIMATE LOCATION OF TEST PIT PERFORMED BY J. DERENZO Co. ON FEBRUARY 18 AND 19, 2020 FOR McPHAIL ASSOCIATES, LLC
-  — APPROXIMATE LOCATION OF EXPLORATION PERFORMED BY OTHERS
-  — APPROXIMATE LOCATION OF DISCRETE SOIL SAMPLES OBTAINED BY McPHAIL ON SEPTEMBER 18, 2020

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED, "SITE LAYOUT & UTILITY PLAN" DATED AUGUST 28, 2018 PREPARED BY CAMBRIDGE SEVEN ARCHITECTS AND PLANNERS

APPROXIMATE LOCATION OF PCB CONTAMINATED SOIL TO WHICH RTN 3-36184 APPLIES (RED)

APPROXIMATE LIMITS OF PROPOSED BUILDING

APPROXIMATE LIMITS OF SUBJECT SITE

GRAPHIC SCALE



Geotechnical and
Geoenvironmental Engineers
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515 SOMERVILLE AVENUE (RTN 3-36184)			
SOMERVILLE		MASSACHUSETTS	
CELL 10 SITE PLAN			
FOR			
YEM SOMERVILLE AVENUE, LLC			
BY			
McPHAIL ASSOCIATES, LLC			
Date: JANUARY 2022	Draw: M.B.S.	Check: W.J.B.	Scale: 1" = 10'
Project No: 6735			

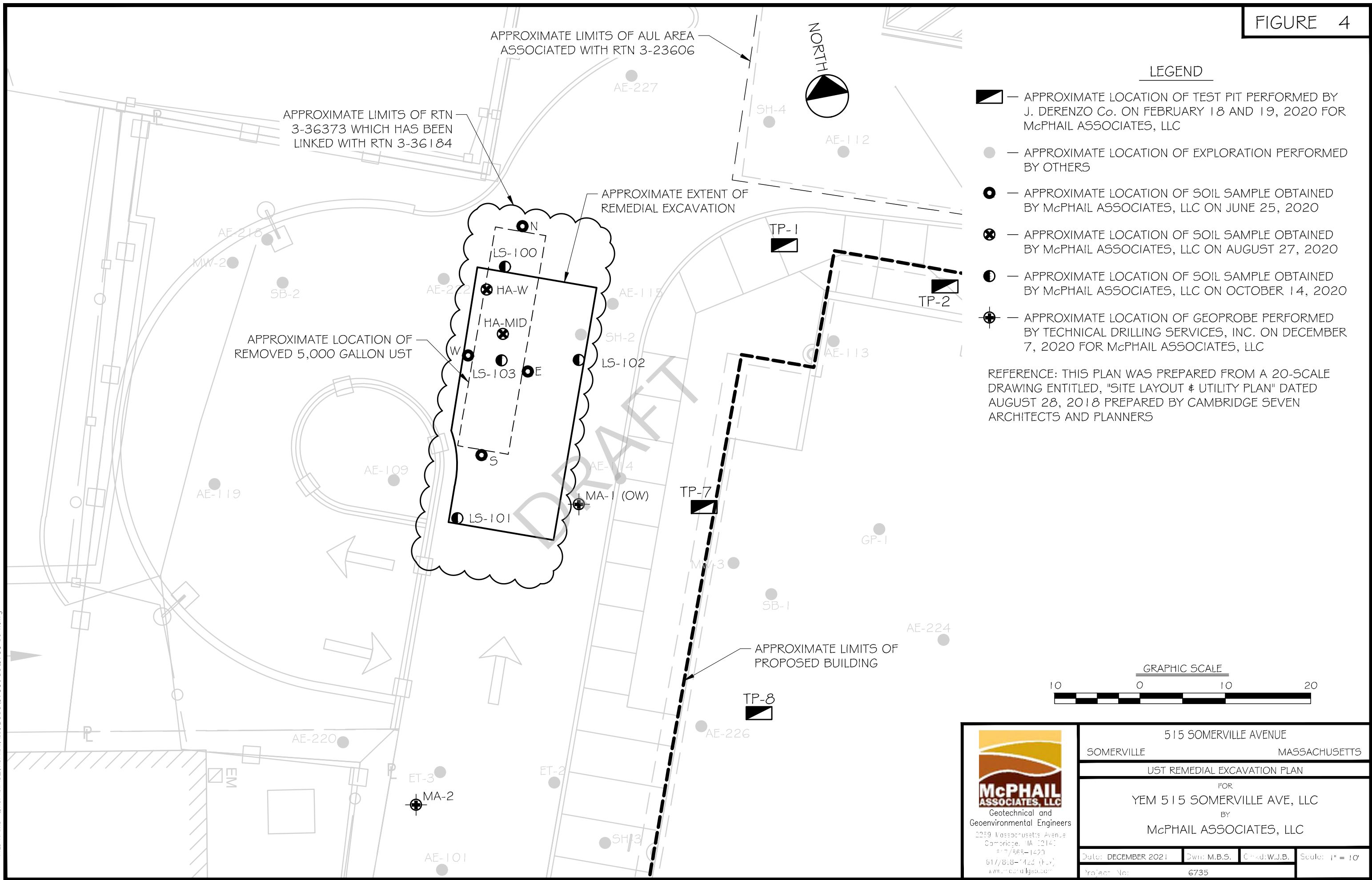


TABLE 1
PID HEADSPACE READINGS - TOTAL VOLATILE ORGANIC COMPOUNDS

515 Somerville Avenue
Somerville, MA
Project No. 6735

EXPLORATION NO.	SAMPLE NO.	SAMPLE DEPTH	SAMPLE TYPE	PID READING (ppm)
TP-9	S1	0-2	URBAN FILL	0.4
	S2	2.0-3.0	URBAN FILL	0.6
	S3	3.4-5	URBAN FILL	0.8
	S4	4.5-6	SAND	0.3
	S5	6.0-8.0	SAND	0.4
	S6	8.0-9.0	SAND	0.3
TP-9A	S1	0-2	URBAN FILL	0.3
	S2	2.0-3.0	URBAN FILL	0.2
	S3	3.4-5	SAND	0.1
	S4	4.5-6	SAND	0.2
	S5	6-7.5	SAND	0.4
	S6	7.5-9	SAND	0.5
UST Grave	UST-N	6	FILL	0.0
	UST-S	6	FILL	0.5
	UST-W	6	FILL	0.0
	UST-E	6	FILL	0.1
	Bottom-1	10	SAND	139.0
	Bottom-2	10	SAND	4100.0
HA-W	S1	Elv. +17 to +15	FILL	0.4
	S2	Elv. +15 to +13	OUTWASH	0.4
	S3	Elv. +13 to +12	OUTWASH	0.6
HA-E	S1	Elv. +17 to +15	FILL	0.4
	S2	Elv. +15 to +13	OUTWASH	0.5
	S3	Elv. +13 to +11	OUTWASH	1641.0
HA-S	S1	Elv. +13 to +11	OUTWASH	989.1
	S2	Elv. +11 to +9	OUTWASH	1426.0
HA-MID	S1	Elv. +14 to +12	OUTWASH	2.4
	S2	Elv. +12 to +10	OUTWASH	1.8
Remedial Excavation	LS-100	Elv.+12	OUTWASH	4.0
	LS-101	Elv.+12	OUTWASH	1054.0
	LS-102	Elv.+11	OUTWASH	118.9
	LS-103	Elv.+10	OUTWASH	64.3
MA-1	S1	0-2.5	FILL	12.0
	S2	2.5-4.5	FILL	5.6
	S3	5.0-7.5	FILL	7.1
	S4	7.5-10	OUTWASH	60.6
	S5	10-12.5	OUTWASH	4177.0
	S6	12.5-15	OUTWASH	4512.0
	S7	15-17.5	OUTWASH	3709.0
	S8	17.5-20	OUTWASH	545.8
MA-2	S1	0-0.5	FILL	24.4
	S2	0.5-2.5	FILL	2.5
	S3	2.5-4.5	FILL	5.0
	S4	5.0-7.5	OUTWASH	3.8
	S5	7.5-10	OUTWASH	3.9
	S6	10-12.5	OUTWASH	1.4
	S7	12.5-15	OUTWASH	11.2
	S8	15-17.5	OUTWASH	28.9
	S9	17.5-20	OUTWASH	5.3

TABLE 2A
LABORATORY ANALYTICAL RESULTS - SOIL
(PCB - McPhail Associates, LLC)

RTN 3-36184
515 Somerville Avenue; Somerville, Massachusetts
Project No. 6735

LOCATION	Method 1 S-1/GW-2 Standards	TP-9	TP-9 6-9'	TP-9A	TP-9A	CELL 10, CENTER	CELL 10, NE	CELL 10, SE
SAMPLING DATE		2/19/2020	2/19/2020	2/19/2020	2/19/2020	9/18/2020	9/18/2020	9/18/2020
LAB SAMPLE ID		L2007474-03	L2007468-13	L2007474-04	L2007468-14	L2039624-01	L2039624-02	L2039624-03
ADDITIONAL LAB ID								
SAMPLE TYPE		Fill	Fill	Fill	Fill	Natural	Natural	Natural
SAMPLE DEPTH (ft.)		0-3	6-9	0-3	6-9	10	7	7
General Chemistry								
Solids, Total		88.3	90.7	83.6	91	95.4	88	96.2
MCP Polychlorinated Biphenyls								
Aroclor 1016	1	ND(0.0373)	ND(0.0356)	ND(0.0397)	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1221	1	ND(0.0373)	ND(0.0356)	ND(0.0397)	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1232	1	ND(0.0373)	ND(0.0356)	ND(0.0397)	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1242	1	ND(0.0373)	ND(0.0356)	ND(0.0397)	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1248	1	ND(0.0373)	ND(0.0356)	0.0796	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1254	1	ND(0.0373)	ND(0.0356)	0.128	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1260	1	ND(0.0373)	ND(0.0356)	0.128	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1262	1	ND(0.0373)	ND(0.0356)	ND(0.0397)	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
Aroclor 1268	1	ND(0.0373)	ND(0.0356)	ND(0.0397)	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)
PCBs, Total	1	ND(0.0373)	ND(0.0356)	0.336	ND(0.0357)	ND(0.0331)	ND(0.0371)	ND(0.0335)

ND - Not detected above the laboratory reporting limit in ()

Bold - exceeds RCS-1 reporting threshold

Tested compounds not shown do not exceed
laboratory reporting limit

TABLE 2B
LABORATORY ANALYTICAL RESULTS - SOIL
(Clean Properties, Inc. 2019)

RTN 3-36184
515 Somerville Avenue; Somerville, MA
Project No. 6735

Phoenix Environmental Laboratories, Inc. 587 East Middle Turnpike P.O. Box 370 Manchester, CT 06040 (860) 645-1102			Lab Sample Id Collection Date Client Id Matrix		Method 1 S-1/GW-2													Max Conc.	Min Conc.		
CE67603		CE67598		CE67604		CE67596		CE67599		CE67605		CE87844									
11/21/2019		11/21/2019		11/21/2019		11/21/2019		11/21/2019		11/21/2019		12/13/2019									
CP-5S3		CP-5E6		CP-5S6		CP-5W9		CP-5E9		CP-5S9		LOC 2 6-12									
Soil		Soil		Soil		Soil		Soil		Soil		Soil									
Result	RL	Result	RL	Result		RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL					
Project Id : 515 SOMERVILLE AVE., SOMERVILLE, MA			CAS																		
Miscellaneous/Inorganics																					
Percent Solid (%)			PHNX - PCTSOLID			88		72		83		91		90		90		89			
PCBs By SW8082A (mg/kg)			total		1																
PCB-1016			12674-11-2		1	< 0.074	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074		
PCB-1221			11104-28-2		1	< 0.074	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074		
PCB-1232			11141-16-5		1	< 0.074	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074		
PCB-1242			53469-21-9		1	< 0.074	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074	0	0
PCB-1248			12672-29-6		1	< 0.074	0.074	0.51	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074	0.51	0.51
PCB-1254			11097-69-1		1	0.15	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074	0.15	0.15
PCB-1260			11096-82-5		1	< 0.074	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074		
PCB-1262			37324-23-5		1	< 0.074	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074		
PCB-1268			11100-14-4		1	< 0.074	0.074	< 0.091	0.091	< 0.4	0.4	< 0.073	0.073	< 0.073	0.073	< 0.072	0.072	< 0.074	0.074		

TABLE 3
ANALYTICAL RESULTS - SOIL
UST Release Limits

RTN 3-36481
515 Somerville Avenue; Somerville, MA
Project No. 6735

LOCATION	Method 1 S-1/GW-2	Method 1 S-1/GW-3	TP-8, S-6	UST COMP	UST-S	UST-B2	HA-MID, S-2	HA-W, S-3	LS-100	LS-101	LS-102	LS-103	MA-2	Number of Samples	Max. Concentration	Min. Concentration	Average	Standard Deviation	95th UCL (EPC)	
SAMPLING DATE			2/18/2020	6/25/2020	6/25/2020	7/16/2020	8/27/2020	8/27/2020	10/14/2020	10/14/2020	10/14/2020	10/14/2020	12/7/2020							
LAB SAMPLE ID			L2007468-20	L2027121-01	L2027121-02	L2030186-01	L2035414-04	L2035414-05	SC59609-01	SC59609-02	SC59609-03	SC59609-04	SC60149-01							
SAMPLE TYPE			Fill	Fill	Fill	Fill	Outwash	Outwash	Outwash	Outwash	Outwash	Outwash	Outwash							
SAMPLE DEPTH (ELEVATION)			Elv. +13 to +11	EL. +17	EL. +17	EL. +14	EL. +12 to +10	EL. +13 to +11	EL. +12	EL. +12	EL. +11	EL. +10	EL. +10 to +7.5							
General Chemistry																				
Solids, Total (%)			81.9	92.2	94.8	93.1	91.4	94.4	88.8	81.4	84.0	86.5	82.9							
Extractable Petroleum Hydrocarbons (mg/kg)																				
C9-C18 Aliphatics	1000	1000	12.1	-	-	13.6	-	-	-	-	-	-	-							
C19-C36 Aliphatics	3000	3000	23.2	-	-	30.7	-	-	-	-	-	-	-							
C11-C22 Aromatics, Adjusted	1000	1000	ND(6.97)	-	-	10.5	-	-	-	-	-	-	-							
Naphthalene	20	500	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
2-Methylnaphthalene	80	300	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Acenaphthylene	600	10	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Acenaphthene	1000	1000	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Fluorene	1000	1000	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Phenanthrene	500	500	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Anthracene	1000	1000	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Fluoranthene	1000	1000	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Pyrene	1000	1000	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Benzo(a)anthracene	7	7	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Chrysene	70	70	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Benzo(b)fluoranthene	7	7	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Benzo(k)fluoranthene	70	70	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Benzo(a)pyrene	2	2	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Indeno(1,2,3-cd)Pyrene	7	7	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Dibenzo(a,h)anthracene	0.7	0.7	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Benzo(ghi)perylene	1000	1000	ND(0.348)	-	-	ND(0.354)	-	-	-	-	-	-	-							
Volatile Petroleum Hydrocarbons (mg/kg)																				
C9-C10 Aromatics	100	100	ND(9.76)	-	38.5	17	ND(6.58)	ND(6.2)	1.29	680	13.8	6.23	ND(6.91)	8	680	ND	92.25125	235.0208138	288.73	
C5-C8 Aliphatics, Adjusted	100	100	ND(9.76)	-	ND(9.49)	ND(5.43)	ND(6.58)	ND(6.2)	ND(5.44)	26.4	6.78	ND(7.52)	5.62	8	26.4	ND	8.74625	7.058261045	14.65	
C9-C12 Aliphatics, Adjusted	1000	1000	ND(9.76)	-	69.7	9.25	ND(6.58)	ND(6.2)	4.65	3450	40.6	ND(18.8)	ND(3.45)	8	3450	ND	442.44125	1202.285012	1447.58	
Benzene	40	40	ND(0.195)	-	ND(0.19)	ND(0.108)	ND(0.132)	ND(0.124)	ND (0.272)	ND (0.357)	ND (0.330)	ND (0.376)	-							
Toluene	500	500	ND(0.195)	-	ND(0.19)	ND(0.108)	ND(0.132)	ND(0.124)	ND (0.272)	ND (0.357)	ND (0.330)	ND (0.376)	-							
Ethylbenzene	500	500	ND(0.195)	-	ND(0.19)	ND(0.108)	ND(0.132)	ND(0.124)	ND (0.272)	6.74	0.501	ND (0.376)	-							
p/m-Xylene	100	500	ND(0.195)	-	ND(0.19)	ND(0.108)	ND(0.132)	ND(0.124)	ND (0.544)	ND (0.713)	ND (0.661)	ND (0.752)	-							
o-Xylene	100	500	ND(0.195)	-	0.838	ND(0.108)	ND(0.132)	ND(0.124)	ND (0.272)	ND (0.357)	ND (0.330)	ND (0.376)	-							
Methyl tert butyl ether	100	100	ND(0.098)	-	ND(0.095)	ND(0.054)	ND(0.066)	ND(0.062)	ND (0.272)	ND (0.357)	ND (0.330)	ND (0.376)	-							
Naphthalene	20	500	ND(0.39)	-	ND(0.38)	ND(0.217)	ND(0.263)	ND(0.248)	ND (0.109)	0.392	ND (0.132)	ND (0.150)	-							

ND - not detected in excess of the
laboratory reporting limits in ()
Bold - exceeds Method 1 S-1 standard
Tested compounds not shown do not
exceed the laboratory reporting limit

TABLE 4
ANALYTICAL RESULTS - GROUNDWATER

RTN 3-36481
515 Somerville Avenue; Somerville, MA
Project No. 6735

Client ID:	Method 1 GW-2	Method 1 GW-3	MA-1 (GW)
Lab ID:			SC60193-01
Matrix:			Ground Water
Sampled:			11-Dec-20
MADEP EPH 5/2004 R (µg/l)			
C9-C18 Aliphatic Hydrocarbons	5000	50000	389
C19-C36 Aliphatic Hydrocarbons		50000	< 100
C11-C22 Aromatic Hydrocarbons	50000	5000	< 100
Naphthalene	700	20000	< 5.00
2-Methylnaphthalene	2000	20000	< 5.00
Acenaphthylene	10000	40	< 5.00
Acenaphthene		10000	< 5.00
Fluorene		40	< 5.00
Phenanthrene		10000	< 5.00
Anthracene		30	< 5.00
Fluoranthene		200	< 5.00
Pyrene		20	< 5.00
Benzo (a) anthracene		1000	< 5.00
Chrysene		70	< 5.00
Benzo (b) fluoranthene		400	< 5.00
Benzo (k) fluoranthene		100	< 5.00
Benzo (a) pyrene		500	< 5.00
Indeno (1,2,3-cd) pyrene		100	< 5.00
Dibenzo (a,h) anthracene		40	< 5.00
Benzo (g,h,i) perylene		20	< 5.00
MADEP VPH 2/2018 Rev. 2.1 (µg/l)			
C5-C8 Aliphatic Hydrocarbons	3000	50000	82.3
C9-C12 Aliphatic Hydrocarbons	5000	50000	1460
C9-C10 Aromatic Hydrocarbons	4000	50000	614
Benzene	1000	10000	< 5.00
Ethylbenzene	20000	5000	5.34
Methyl tert-butyl ether	50000	50000	< 5.00
Naphthalene	700	20000	19.2
Toluene	50000	40000	< 5.00
m,p-Xylene			< 10.0
o-Xylene			< 5.00

ND-not detected in excess of the
laboratory reporting limit in <



APPENDIX A:
LIMITATIONS

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LIMITATIONS

The above observations were made under the conditions stated in this report. The conclusions presented above were based on these observations. If variations in the observed nature and extent of subsurface conditions between the subsurface explorations that were performed become evident in the future, it will be necessary to re-evaluate the conclusions presented herein after performing on-site observations and noting the characteristics of any variations.

The conclusions submitted in this report are based in part upon analytical data obtained from analysis of a specific number of soil samples, as well as screening of soil samples for volatile organics, and are contingent upon their validity. These data have been reviewed, and interpretations have been made in the text. It should also be noted that fluctuations in the types and levels of contaminants and variations in their flow paths may occur due to changes in seasonal water table, past practices used and other factors.

The purpose of this report was to assess the physical characteristics of the site located at 515 Somerville Avenue in Somerville, Massachusetts with regard to the release of hazardous material or oil, as defined in Massachusetts General Laws Chapter 21E and the Massachusetts Contingency Plan 310 CMR 40.0000. No attempt was made to check on the compliance of present or past owners of the site with federal, state, or local laws and regulations except as otherwise documented herein.

Laboratory analyses have been performed for specific constituents during the course of this site assessment, as described in the text.

This study and report have been prepared on behalf of and for the exclusive use of YEM Somerville Avenue, LLC and the Massachusetts Department of Environmental Protection solely for use in an environmental evaluation of the site. This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party nor used in whole or in part by any other party without prior written consent of McPhail Associates, LLC.



APPENDIX B:

**GROUNDWATER SUMMARY TABLE & LABORATORY DATA- CLEAN
PROPERTIES, INC.**

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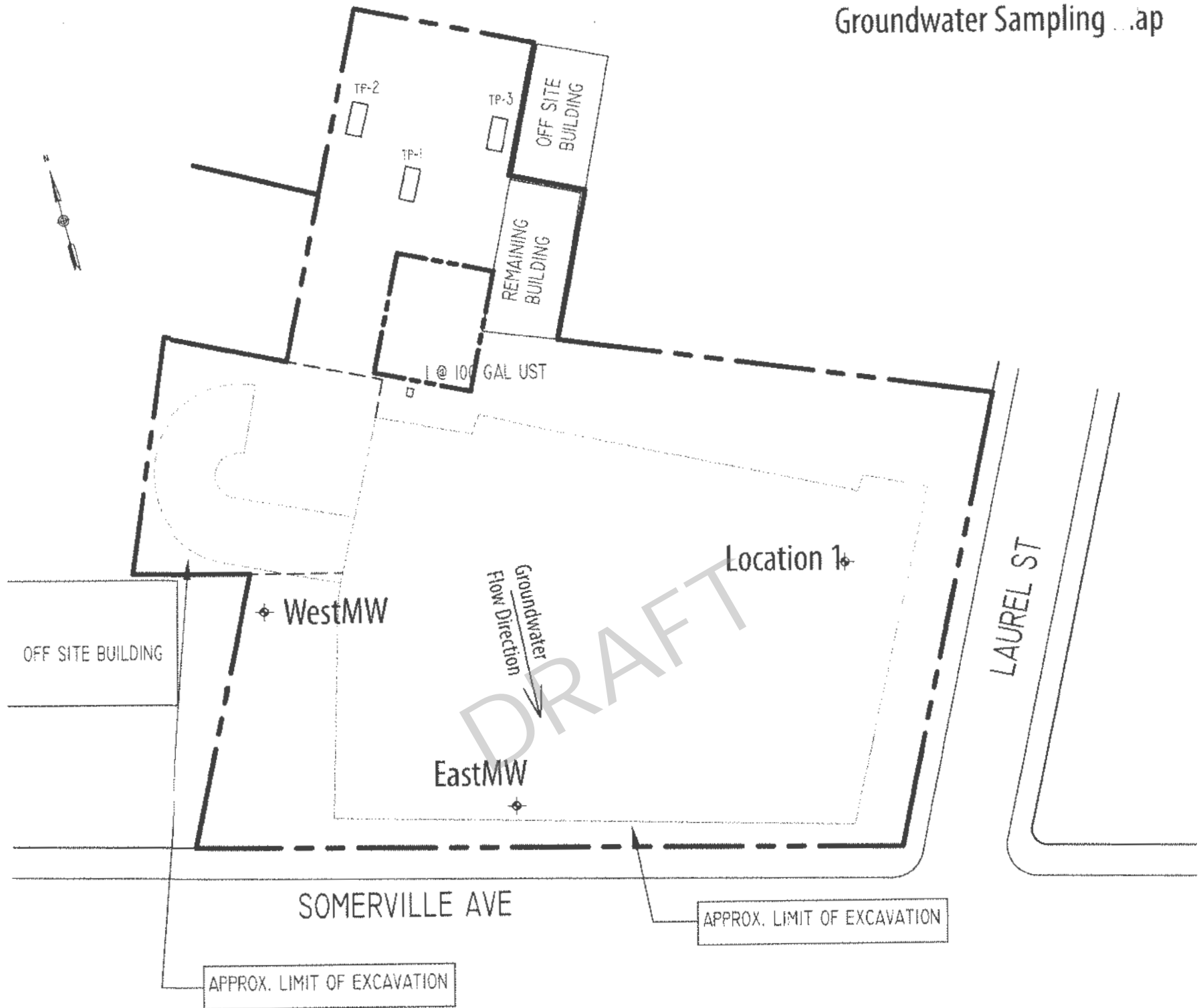


Table 2
Groundwater Test Results
515 SOMERVILLE AVE.,
SOMERVILLE, MA

Table 2		Collection Date	12/17/2019		12/17/2019		12/13/2019	
Groundwater Test Results		Sample ID	WEST MW		EAST MW		LOCATION 1	
515 SOMERVILLE AVE.,		Matrix	Ground Water		Ground Water		Ground Water	
SOMERVILLE, MA		Units	Result	RL	Result	RL	Result	RL
Miscellaneous/Inorganics								
pH		pH Units	6.38	1.00	7.49	1.00	NT	NT
Metals, Total								
Antimony		mg/L	< 0.005	0.005	< 0.005	0.005	NT	NT
Arsenic		mg/L	0.018	0.004	0.087	0.004	NT	NT
Cadmium		mg/L	0.004	0.001	0.011	0.001	NT	NT
Chromium		mg/L	0.026	0.001	0.142	0.001	NT	NT
Copper		mg/L	0.07	0.005	1.29	0.005	NT	NT
Lead		mg/L	0.051	0.002	2.19	0.020	NT	NT
Mercury		mg/L	< 0.002	0.002	< 0.002	0.002	NT	NT
Nickel		mg/L	0.023	0.001	0.142	0.001	NT	NT
Selenium		mg/L	< 0.010	0.010	< 0.010	0.010	NT	NT
Silver		mg/L	< 0.001	0.001	< 0.001	0.001	NT	NT
Zinc		mg/L	0.362	0.004	1.78	0.004	NT	NT
PCBs By E608.3								
PCB-1016		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1221		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1232		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1242		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1248		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1254		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1260		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1262		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
PCB-1268		ug/L	< 0.056	0.056	< 0.071	0.071	NT	NT
Volatiles By E624.1								
1,1,1-Trichloroethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,1,2,2-tetrachloroethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,1,2-Trichloroethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,1-Dichloroethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,1-Dichloroethene		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,2-Dichlorobenzene		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,2-Dichloroethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,2-Dichloropropane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,3-Dichlorobenzene		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
1,4-Dichlorobenzene		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Benzene		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Bromodichloromethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Bromoform		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Bromomethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Carbon tetrachloride		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Chlorobenzene		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Chloroethane		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Chloroform		ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Chloromethane		ug/L	< 0.50	0.50	< 0.50	0.50	1.8	0.5

Table 2
Groundwater Test Results
515 SOMERVILLE AVE.,
SOMERVILLE, MA

	Collection Date Sample ID Matrix Units	12/17/2019 WEST MW Ground Water		12/17/2019 EAST MW Ground Water		12/13/2019 LOCATION 1 Ground Water	
		Result	RL	Result	RL	Result	RL
cis-1,2-Dichloroethene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
cis-1,3-Dichloropropene	ug/L	< 0.40	0.40	< 0.40	0.40	< 0.40	0.4
Dibromochloromethane	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Ethylbenzene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
m&p-Xylene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Methyl tert-butyl ether (MTBE)	ug/L	< 1.0	1.0	< 1.0	1.0	< 1.0	1
Methylene chloride	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
o-Xylene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Tetrachloroethene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Toluene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
trans-1,2-Dichloroethene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
trans-1,3-Dichloropropene	ug/L	< 0.40	0.40	< 0.40	0.40	< 0.40	0.4
Trichloroethene	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Trichlorofluoromethane	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Vinyl chloride	ug/L	< 0.50	0.50	< 0.50	0.50	< 0.50	0.5
Summary of Results by Date: 12/13/2019							
1,2,4-Trichlorobenzene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
1,2-Dichlorobenzene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
1,2-Diphenylhydrazine	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
1,3-Dichlorobenzene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
1,4-Dichlorobenzene	ug/L	< 5.0	5.0	< 7.2	7.2	< 5.0	5
2,4,5-Trichlorophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2,4,6-Trichlorophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2,4-Dichlorophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2,4-Dimethylphenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2,4-Dinitrophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2,4-Dinitrotoluene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2,6-Dichlorophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2,6-Dinitrotoluene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2-Chloronaphthalene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2-Chlorophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2-Methylnaphthalene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2-Methylphenol (o-cresol)	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
2-Nitroaniline	ug/L	< 10	10	< 14	14	< 20	20
2-Nitrophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
3&4-Methylphenol (m&p-cresol)	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
3,3'-Dichlorobenzidine	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
3-Nitroaniline	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
4,6-Dinitro-2-methylphenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
4-Bromophenyl phenyl ether	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
4-Chloro-3-methylphenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
4-Chloroaniline	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
4-Chlorophenyl phenyl ether	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
4-Nitroaniline	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
4-Nitrophenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Anthracene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Benzidine	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Benzoic acid	ug/L	< 10	10	< 14	14	< 20	20
Benzyl alcohol	ug/L	< 10	10	< 14	14	< 20	20
Benzyl butyl phthalate	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Bis(2-chloroethoxy)methane	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10

Table 2
Groundwater Test Results
515 SOMERVILLE AVE.,
SOMERVILLE, MA

	Collection Date Sample ID Matrix Units	12/17/2019 WEST MW Ground Water		12/17/2019 EAST MW Ground Water		12/13/2019 LOCATION 1 Ground Water	
		Result	RL	Result	RL	Result	RL
Bis(2-chloroethyl)ether	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Bis(2-chloroisopropyl)ether	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Bis(2-ethylhexyl)phthalate	ug/L	< 1.0	1.0	< 1.4	1.4	3.8	2
Dibenzofuran	ug/L	< 1.0	1.0	< 1.4	1.4	< 2.0	2
Diethyl phthalate	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Dimethylphthalate	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Di-n-butylphthalate	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Di-n-octylphthalate	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Fluoranthene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Fluorene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Hexachloroethane	ug/L	< 1.0	1.0	< 1.4	1.4	< 2.0	2
Isophorone	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Naphthalene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
N-Nitrosodi-n-propylamine	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
N-Nitrosodiphenylamine	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Phenol	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10
Pyrene	ug/L	< 5.0	5.0	< 7.2	7.2	< 10	10

Semivolatiles by (SIM) by E625.1/E625.1SIM

Acenaphthene	ug/L	< 0.05	0.05	< 0.07	0.07	< 0.10	0.1
Acenaphthylene	ug/L	< 0.05	0.05	< 0.07	0.07	< 0.10	0.1
Benzo(a)anthracene	ug/L	< 0.04	0.04	1.1	0.06	< 0.08	0.08
Benzo(a)pyrene	ug/L	< 0.05	0.05	1.1	0.07	< 0.10	0.1
Benzo(b)fluoranthene	ug/L	< 0.05	0.05	0.89	0.07	< 0.10	0.1
Benzo(g,h,i)perylene	ug/L	< 0.10	0.10	0.75	0.14	< 0.20	0.2
Benzo(k)fluoranthene	ug/L	< 0.05	0.05	0.96	0.07	< 0.10	0.1
Chrysene	ug/L	< 0.05	0.05	1.1	0.07	< 0.10	0.1
Dibenz(a,h)anthracene	ug/L	< 0.02	0.02	0.11	0.03	< 0.04	0.04
Hexachlorobenzene	ug/L	< 0.06	0.06	< 0.09	0.09	< 0.12	0.12
Hexachlorobutadiene	ug/L	< 0.10	0.10	< 0.14	0.14	< 0.20	0.2
Hexachlorocyclopentadiene	ug/L	< 0.10	0.10	< 0.14	0.14	< 0.20	0.2
Indeno(1,2,3-c,d)pyrene	ug/L	< 0.05	0.05	0.93	0.07	< 0.10	0.1
Nitrobenzene	ug/L	< 0.10	0.10	< 0.14	0.14	< 0.20	0.2
N-Nitrosodimethylamine	ug/L	< 0.05	0.05	< 0.07	0.07	< 0.10	0.1
Pentachlorophenol	ug/L	< 0.05	0.05	< 0.07	0.07	< 0.10	0.1
Phenanthrene	ug/L	< 0.05	0.05	0.93	0.07	< 0.10	0.1
Pyridine	ug/L	< 0.50	0.50	< 0.72	0.72	< 1.0	1

Pesticides By E608.3

4,4' -DDD	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
4,4' -DDE	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
4,4' -DDT	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
a-BHC	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
a-chlordane	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Aldrin	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
b-BHC	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Chlordane	ug/L	< 0.28	0.28	< 0.35	0.35	NT	NT
d-BHC	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Dieldrin	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Endosulfan I	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT

Table 2
Groundwater Test Results
515 SOMERVILLE AVE.,
SOMERVILLE, MA

	Collection Date Sample ID Matrix Units	12/17/2019 WEST MW Ground Water		12/17/2019 EAST MW Ground Water		12/13/2019 LOCATION 1 Ground Water	
		Result	RL	Result	RL	Result	RL
Endosulfan II	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Endosulfan sulfate	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Endrin	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Endrin aldehyde	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Endrin ketone	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
g-BHC	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
g-chlordane	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Heptachlor	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Heptachlor epoxide	ug/L	< 0.056	0.056	< 0.070	0.070	NT	NT
Methoxychlor	ug/L	< 0.56	0.56	< 0.70	0.70	NT	NT
Toxaphene	ug/L	< 1.1	1.1	< 1.4	1.4	NT	NT
Acrolein, Acrylonitrile, 2-Chloroethyl vinyl ether							
2-Chloroethyl vinyl ether	ug/L	< 5.0	5.0	< 5.0	5.0	NT	NT
Acrolein	ug/L	< 5.0	5.0	< 5.0	5.0	NT	NT
Acrylonitrile	ug/L	< 5.0	5.0	< 5.0	5.0	NT	NT

Result Detected

DRAFT

DRAFT



Tuesday, December 24, 2019

Attn: Ms. Marcia J. Berger
Clean Properties Inc.
111 Boston Post Rd Suite 211
Sudbury MA 01776

Project ID: 515 SOMERVILLE AVE SOMERVILLE MA
SDG ID: GCE90154
Sample ID#s: CE90154 - CE90155

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Phyllis Shiller".

Phyllis Shiller

Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B

NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
UT Lab Registration #CT00007
VT Lab Registration #VT11301

DRAFT



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Sample Id Cross Reference

December 24, 2019

SDG I.D.: GCE90154

Project ID: 515 SOMERVILLE AVE SOMERVILLE MA

Client Id	Lab Id	Matrix
WEST MW	CE90154	GROUND WATER
EAST MW	CE90155	GROUND WATER

DRAFT



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Analysis Report

December 24, 2019

FOR: Attn: Ms. Marcia J. Berger
Clean Properties Inc.
111 Boston Post Rd Suite 211
Sudbury MA 01776

Sample Information

Matrix: GROUND WATER
Location Code: CLEANPROP
Rush Request: 24 Hour
P.O.#:

Custody Information

Collected by:
Received by: B
Analyzed by: see "By" below

Date Time

12/17/19
12/18/19 16:36

Laboratory Data

SDG ID: GCE90154
Phoenix ID: CE90154

Project ID: 515 SOMERVILLE AVE SOMERVILLE MA
Client ID: WEST MW

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
Silver	< 0.001	0.001		mg/L	1	12/20/19	EK	SW6010D
Arsenic	0.018	0.004		mg/L	1	12/20/19	EK	SW6010D
Cadmium	0.004	0.001		mg/L	1	12/20/19	EK	SW6010D
Chromium	0.026	0.001		mg/L	1	12/20/19	EK	SW6010D
Copper	0.070	0.005		mg/L	1	12/20/19	EK	SW6010D
Mercury	< 0.002	0.002		mg/L	1	12/19/19	RS	SW7470A
Nickel	0.023	0.001		mg/L	1	12/20/19	EK	SW6010D
Lead	0.051	0.002		mg/L	1	12/20/19	EK	SW6010D
Antimony	< 0.005	0.005		mg/L	1	12/20/19	EK	SW6010D
Selenium	< 0.010	0.010		mg/L	1	12/20/19	EK	SW6010D
Zinc	0.362	0.004		mg/L	1	12/20/19	EK	SW6010D
pH	6.38	1.00		pH Units	1	12/19/19 00:28	AP	SM4500-H B-11
Mercury Digestion	Completed					12/19/19	LS/LS	SW7470A
PCB Extraction	Completed					12/18/19		E608.3
Extraction for Pest (2 Liter)	Completed					12/18/19		E608.3
Semi-Volatile Extraction	Completed					12/18/19		E625.1
Total Metals Digestion	Completed					12/19/19	AG	

Polychlorinated Biphenyls

PCB-1016	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1221	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1232	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1242	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1248	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1254	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1260	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1262	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3
PCB-1268	ND	0.056	0.056	ug/L	1	12/19/19	SC	E608.3

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
<u>QA/QC Surrogates</u>								
% DCBP	82			%	1	12/19/19	SC	30 - 150 %
% DCBP (Confirmation)	83			%	1	12/19/19	SC	30 - 150 %
% TCMX	73			%	1	12/19/19	SC	30 - 150 %
% TCMX (Confirmation)	69			%	1	12/19/19	SC	30 - 150 %
<u>Pesticides</u>								
4,4' -DDD	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
4,4' -DDE	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
4,4' -DDT	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
a-BHC	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
a-chlordane	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Aldrin	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
b-BHC	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Chlordane	ND	0.28	0.28	ug/L	5	12/19/19	CG	E608.3
d-BHC	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Dieldrin	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Endosulfan I	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Endosulfan II	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Endosulfan sulfate	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Endrin	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Endrin aldehyde	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Endrin ketone	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
g-BHC	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
g-chlordane	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Heptachlor	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Heptachlor epoxide	ND	0.056	0.056	ug/L	5	12/19/19	CG	E608.3
Methoxychlor	ND	0.56	0.56	ug/L	5	12/19/19	CG	E608.3
Toxaphene	ND	1.1	1.1	ug/L	5	12/19/19	CG	E608.3
<u>QA/QC Surrogates</u>								
% DCBP	122			%	5	12/19/19	CG	40 - 140 %
% DCBP (Confirmation)	95			%	5	12/19/19	CG	40 - 140 %
% TCMX	88			%	5	12/19/19	CG	40 - 140 %
% TCMX (Confirmation)	88			%	5	12/19/19	CG	40 - 140 %
<u>Acrolein, Acrylonitrile, 2 CEVE</u>								
2-Chloroethyl vinyl ether	ND	5.0	5.0	ug/L	1	12/18/19	MH	E624.1 As is
Acrolein	ND	5.0	1.0	ug/L	1	12/18/19	MH	E624.1 As is
Acrylonitrile	ND	5.0	0.50	ug/L	1	12/18/19	MH	E624.1 As is
<u>Volatiles</u>								
1,1,1-Trichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1,2,2-tetrachloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1,2-Trichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1-Dichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1-Dichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,2-Dichlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,2-Dichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,2-Dichloropropane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,3-Dichlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
1,4-Dichlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Benzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Bromodichloromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Bromoform	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Bromomethane	ND	0.50	0.50	ug/L	1	12/18/19	MH	E624.1
Carbon tetrachloride	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chloroform	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chloromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
cis-1,2-Dichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
cis-1,3-Dichloropropene	ND	0.40	0.25	ug/L	1	12/18/19	MH	E624.1
Dibromochloromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Ethylbenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
m&p-Xylene	ND	0.50	0.42	ug/L	1	12/18/19	MH	E624.1
Methyl tert-butyl ether (MTBE)	ND	1.0	0.50	ug/L	1	12/18/19	MH	E624.1
Methylene chloride	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
o-Xylene	ND	0.50	0.45	ug/L	1	12/18/19	MH	E624.1
Tetrachloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Toluene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
trans-1,2-Dichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
trans-1,3-Dichloropropene	ND	0.40	0.25	ug/L	1	12/18/19	MH	E624.1
Trichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Trichlorofluoromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Vinyl chloride	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
<u>QA/QC Surrogates</u>								
% 1,2-dichlorobenzene-d4	103			%	1	12/18/19	MH	70 - 130 %
% Bromofluorobenzene	90			%	1	12/18/19	MH	70 - 130 %
% Dibromofluoromethane	108			%	1	12/18/19	MH	70 - 130 %
% Toluene-d8	104			%	1	12/18/19	MH	70 - 130 %
<u>Semivolatiles by (SIM)</u>								
Acenaphthene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Acenaphthylene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzo(a)anthracene	ND	0.04	0.04	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzo(a)pyrene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzo(b)fluoranthene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzo(g,h,i)perylene	ND	0.10	0.10	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzo(k)fluoranthene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Chrysene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Dibenz(a,h)anthracene	ND	0.02	0.01	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Hexachlorobenzene	ND	0.06	0.06	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Hexachlorobutadiene	ND	0.10	0.10	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Hexachlorocyclopentadiene	ND	0.10	0.10	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Indeno(1,2,3-c,d)pyrene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Nitrobenzene	ND	0.10	0.10	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
N-Nitrosodimethylamine	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Pentachlorophenol	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Phenanthrene	ND	0.05	0.05	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Pyridine	ND	0.50	1.2	ug/L	1	12/19/19	AW	E625.1/E625.1SIM

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
<u>QA/QC Surrogates</u>								
% 2,4,6-Tribromophenol	55			%	1	12/19/19	AW	15 - 110 %
% 2-Fluorobiphenyl	54			%	1	12/19/19	AW	40 - 140 %
% 2-Fluorophenol	41			%	1	12/19/19	AW	15 - 110 %
% Nitrobenzene-d5	45			%	1	12/19/19	AW	40 - 140 %
% Phenol-d5	23			%	1	12/19/19	AW	15 - 110 %
% Terphenyl-d14	60			%	1	12/19/19	AW	40 - 140 %
<u>Semivolatiles</u>								
1,2,4-Trichlorobenzene	ND	5.0	1.5	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
1,2-Dichlorobenzene	ND	5.0	1.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
1,2-Diphenylhydrazine	ND	5.0	5.0	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
1,3-Dichlorobenzene	ND	5.0	1.5	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
1,4-Dichlorobenzene	ND	5.0	1.5	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,4,5-Trichlorophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,4,6-Trichlorophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,4-Dichlorophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,4-Dimethylphenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,4-Dinitrophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,4-Dinitrotoluene	ND	5.0	2.0	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,6-Dichlorophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2,6-Dinitrotoluene	ND	5.0	1.6	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2-Chloronaphthalene	ND	5.0	1.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2-Chlorophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2-Methylnaphthalene	ND	5.0	1.5	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2-Methylphenol (o-cresol)	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2-Nitroaniline	ND	10	5.1	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
2-Nitrophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
3&4-Methylphenol (m&p-cresol)	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
3,3'-Dichlorobenzidine	ND	5.0	2.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
3-Nitroaniline	ND	5.0	5.0	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
4,6-Dinitro-2-methylphenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
4-Bromophenyl phenyl ether	ND	5.0	1.5	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
4-Chloro-3-methylphenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
4-Chloroaniline	ND	5.0	2.3	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
4-Chlorophenyl phenyl ether	ND	5.0	1.7	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
4-Nitroaniline	ND	5.0	1.7	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
4-Nitrophenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Anthracene	ND	5.0	1.6	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzidine	ND	5.0	2.9	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzoic acid	ND	10	10	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzyl alcohol	ND	10	5.0	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Benzyl butyl phthalate	ND	5.0	1.3	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Bis(2-chloroethoxy)methane	ND	5.0	1.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Bis(2-chloroethyl)ether	ND	5.0	1.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Bis(2-chloroisopropyl)ether	ND	5.0	1.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Bis(2-ethylhexyl)phthalate	ND	1.0	1.0	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Dibenzofuran	ND	1.0	1.0	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Diethyl phthalate	ND	5.0	1.6	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Dimethylphthalate	ND	5.0	1.6	ug/L	1	12/19/19	AW	E625.1/E625.1SIM

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
Di-n-butylphthalate	ND	5.0	1.3	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Di-n-octylphthalate	ND	5.0	1.3	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Fluoranthene	ND	5.0	1.6	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Fluorene	ND	5.0	1.7	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Hexachloroethane	ND	1.0	1.0	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Isophorone	ND	5.0	1.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Naphthalene	ND	5.0	1.4	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
N-Nitrosodi-n-propylamine	ND	5.0	1.6	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
N-Nitrosodiphenylamine	ND	5.0	1.9	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Phenol	ND	5.0	0.90	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
Pyrene	ND	5.0	1.7	ug/L	1	12/19/19	AW	E625.1/E625.1SIM
QA/QC Surrogates								
% 2,4,6-Tribromophenol	77			%	1	12/19/19	AW	15 - 130 %
% 2-Fluorobiphenyl	69			%	1	12/19/19	AW	30 - 130 %
% 2-Fluorophenol	35			%	1	12/19/19	AW	10 - 130 %
% Nitrobenzene-d5	63			%	1	12/19/19	AW	15 - 130 %
% Phenol-d5	25			%	1	12/19/19	AW	10 - 130 %
% Terphenyl-d14	70			%	1	12/19/19	AW	30 - 130 %

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level LOD=Limit of Detection
MDL=Method Detection Limit1

QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

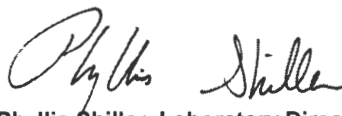
The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

Per 1.4.6 of EPA method 8270D, 1,2-Diphenylhydrazine is unstable and readily converts to Azobenzene. Azobenzene is used for the calibration of 1,2-Diphenylhydrazine.

Semi-Volatile Comment:

Poor surrogate recovery was observed for one acid and/or one base surrogate. The other surrogates associated with this sample were within QA/QC criteria. No significant bias suspected.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director

December 24, 2019

Reviewed and Released by: Greg Lawrence, Assistant Lab Director

DRAFT



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Analysis Report

December 24, 2019

FOR: Attn: Ms. Marcia J. Berger
Clean Properties Inc.
111 Boston Post Rd Suite 211
Sudbury MA 01776

Sample Information

Matrix: GROUND WATER
Location Code: CLEANPROP
Rush Request: 48 Hour
P.O.#:

Custody Information

Collected by:
Received by: B
Analyzed by: see "By" below

Date Time

12/17/19
12/18/19 16:36

Laboratory Data

SDG ID: GCE90154
Phoenix ID: CE90155

Project ID: 515 SOMERVILLE AVE SOMERVILLE MA
Client ID: EAST MW

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
Silver	< 0.001	0.001		mg/L	1	12/20/19	EK	SW6010D
Arsenic	0.087	0.004		mg/L	1	12/20/19	EK	SW6010D
Cadmium	0.011	0.001		mg/L	1	12/20/19	EK	SW6010D
Chromium	0.142	0.001		mg/L	1	12/20/19	EK	SW6010D
Copper	1.29	0.005		mg/L	1	12/20/19	EK	SW6010D
Mercury	< 0.002	0.002		mg/L	1	12/19/19	RS	SW7470A
Nickel	0.142	0.001		mg/L	1	12/20/19	EK	SW6010D
Lead	2.19	0.020		mg/L	10	12/20/19	EK	SW6010D
Antimony	< 0.005	0.005		mg/L	1	12/20/19	EK	SW6010D
Selenium	< 0.010	0.010		mg/L	1	12/20/19	EK	SW6010D
Zinc	1.78	0.004		mg/L	1	12/20/19	EK	SW6010D
pH	7.49	1.00		pH Units	1	12/19/19 00:31	AP	SM4500-H B-11
Mercury Digestion	Completed					12/19/19	LS/LS	SW7470A
PCB Extraction	Completed					12/18/19		E608.3
Extraction for Pest (2 Liter)	Completed					12/18/19		E608.3
Semi-Volatile Extraction	Completed					12/19/19	C	E625.1
Total Metals Digestion	Completed					12/19/19	AG	

Polychlorinated Biphenyls

PCB-1016	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1221	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1232	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1242	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1248	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1254	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1260	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1262	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3
PCB-1268	ND	0.071	0.071	ug/L	1	12/19/19	SC	E608.3

DRAFT

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
<u>QA/QC Surrogates</u>								
% DCBP	65			%	1	12/19/19	SC	30 - 150 %
% DCBP (Confirmation)	62			%	1	12/19/19	SC	30 - 150 %
% TCMX	78			%	1	12/19/19	SC	30 - 150 %
% TCMX (Confirmation)	71			%	1	12/19/19	SC	30 - 150 %
<u>Pesticides</u>								
4,4' -DDD	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
4,4' -DDE	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
4,4' -DDT	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
a-BHC	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
a-chlordane	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Aldrin	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
b-BHC	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Chlordane	ND	0.35	0.35	ug/L	5	12/19/19	CG	E608.3
d-BHC	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Dieldrin	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Endosulfan I	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Endosulfan II	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Endosulfan sulfate	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Endrin	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Endrin aldehyde	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Endrin ketone	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
g-BHC	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
g-chlordane	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Heptachlor	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Heptachlor epoxide	ND	0.070	0.070	ug/L	5	12/19/19	CG	E608.3
Methoxychlor	ND	0.70	0.70	ug/L	5	12/19/19	CG	E608.3
Toxaphene	ND	1.4	1.4	ug/L	5	12/19/19	CG	E608.3
<u>QA/QC Surrogates</u>								
% DCBP	107			%	5	12/19/19	CG	40 - 140 %
% DCBP (Confirmation)	111			%	5	12/19/19	CG	40 - 140 %
% TCMX	87			%	5	12/19/19	CG	40 - 140 %
% TCMX (Confirmation)	89			%	5	12/19/19	CG	40 - 140 %
<u>Acrolein, Acrylonitrile, 2 CEVE</u>								
2-Chloroethyl vinyl ether	ND	5.0	5.0	ug/L	1	12/18/19	MH	E624.1 As is
Acrolein	ND	5.0	1.0	ug/L	1	12/18/19	MH	E624.1 As is
Acrylonitrile	ND	5.0	0.50	ug/L	1	12/18/19	MH	E624.1 As is
<u>Volatiles</u>								
1,1,1-Trichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1,2,2-tetrachloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1,2-Trichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1-Dichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,1-Dichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,2-Dichlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,2-Dichloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,2-Dichloropropane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
1,3-Dichlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
1,4-Dichlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Benzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Bromodichloromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Bromoform	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Bromomethane	ND	0.50	0.50	ug/L	1	12/18/19	MH	E624.1
Carbon tetrachloride	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chlorobenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chloroethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chloroform	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Chloromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
cis-1,2-Dichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
cis-1,3-Dichloropropene	ND	0.40	0.25	ug/L	1	12/18/19	MH	E624.1
Dibromochloromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Ethylbenzene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
m&p-Xylene	ND	0.50	0.42	ug/L	1	12/18/19	MH	E624.1
Methyl tert-butyl ether (MTBE)	ND	1.0	0.50	ug/L	1	12/18/19	MH	E624.1
Methylene chloride	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
o-Xylene	ND	0.50	0.45	ug/L	1	12/18/19	MH	E624.1
Tetrachloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Toluene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
trans-1,2-Dichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
trans-1,3-Dichloropropene	ND	0.40	0.25	ug/L	1	12/18/19	MH	E624.1
Trichloroethene	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Trichlorofluoromethane	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1
Vinyl chloride	ND	0.50	0.25	ug/L	1	12/18/19	MH	E624.1

QA/QC Surrogates

% 1,2-dichlorobenzene-d4	100			%	1	12/18/19	MH	70 - 130 %
% Bromofluorobenzene	90			%	1	12/18/19	MH	70 - 130 %
% Dibromofluoromethane	114			%	1	12/18/19	MH	70 - 130 %
% Toluene-d8	104			%	1	12/18/19	MH	70 - 130 %

Semivolatiles by (SIM)

Acenaphthene	ND	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Acenaphthylene	ND	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzo(a)anthracene	1.1	0.06	0.06	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzo(a)pyrene	1.1	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzo(b)fluoranthene	0.89	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzo(g,h,i)perylene	0.75	0.14	0.14	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzo(k)fluoranthene	0.96	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Chrysene	1.1	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Dibenz(a,h)anthracene	0.11	0.03	0.01	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Hexachlorobenzene	ND	0.09	0.09	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Hexachlorobutadiene	ND	0.14	0.14	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Hexachlorocyclopentadiene	ND	0.14	0.14	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Indeno(1,2,3-c,d)pyrene	0.93	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Nitrobenzene	ND	0.14	0.14	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
N-Nitrosodimethylamine	ND	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Pentachlorophenol	ND	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Phenanthrene	0.93	0.07	0.07	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Pyridine	ND	0.72	1.8	ug/L	1	12/20/19	WB	E625.1/E625.1SIM

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
<u>QA/QC Surrogates</u>								
% 2,4,6-Tribromophenol	85			%	1	12/20/19	WB	15 - 110 %
% 2-Fluorobiphenyl	62			%	1	12/20/19	WB	40 - 140 %
% 2-Fluorophenol	41			%	1	12/20/19	WB	15 - 110 %
% Nitrobenzene-d5	57			%	1	12/20/19	WB	40 - 140 %
% Phenol-d5	31			%	1	12/20/19	WB	15 - 110 %
% Terphenyl-d14	72			%	1	12/20/19	WB	40 - 140 %
<u>Semivolatiles</u>								
1,2,4-Trichlorobenzene	ND	7.2	2.2	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
1,2-Dichlorobenzene	ND	7.2	2.0	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
1,2-Diphenylhydrazine	ND	7.2	7.2	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
1,3-Dichlorobenzene	ND	7.2	2.1	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
1,4-Dichlorobenzene	ND	7.2	2.1	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,4,5-Trichlorophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,4,6-Trichlorophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,4-Dichlorophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,4-Dimethylphenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,4-Dinitrophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,4-Dinitrotoluene	ND	7.2	2.8	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,6-Dichlorophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2,6-Dinitrotoluene	ND	7.2	2.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2-Chloronaphthalene	ND	7.2	2.0	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2-Chlorophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2-Methylnaphthalene	ND	7.2	2.1	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2-Methylphenol (o-cresol)	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2-Nitroaniline	ND	14	7.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
2-Nitrophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
3&4-Methylphenol (m&p-cresol)	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
3,3'-Dichlorobenzidine	ND	7.2	3.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
3-Nitroaniline	ND	7.2	7.2	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
4,6-Dinitro-2-methylphenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
4-Bromophenyl phenyl ether	ND	7.2	2.1	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
4-Chloro-3-methylphenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
4-Chloroaniline	ND	7.2	3.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
4-Chlorophenyl phenyl ether	ND	7.2	2.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
4-Nitroaniline	ND	7.2	2.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
4-Nitrophenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Anthracene	ND	7.2	2.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzidine	ND	7.2	4.2	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzoic acid	ND	14	14	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzyl alcohol	ND	14	7.2	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Benzyl butyl phthalate	ND	7.2	1.9	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Bis(2-chloroethoxy)methane	ND	7.2	2.0	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Bis(2-chloroethyl)ether	ND	7.2	1.9	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Bis(2-chloroisopropyl)ether	ND	7.2	2.0	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Bis(2-ethylhexyl)phthalate	ND	1.4	1.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Dibenzofuran	ND	1.4	1.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Diethyl phthalate	ND	7.2	2.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Dimethylphthalate	ND	7.2	2.2	ug/L	1	12/20/19	WB	E625.1/E625.1SIM

Parameter	Result	RL/ PQL	LOD/ MDL	Units	Dilution	Date/Time	By	Reference
Di-n-butylphthalate	ND	7.2	1.9	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Di-n-octylphthalate	ND	7.2	1.9	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Fluoranthene	ND	7.2	2.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Fluorene	ND	7.2	2.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Hexachloroethane	ND	1.4	1.4	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Isophorone	ND	7.2	2.0	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Naphthalene	ND	7.2	2.1	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
N-Nitrosodi-n-propylamine	ND	7.2	2.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
N-Nitrosodiphenylamine	ND	7.2	2.8	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Phenol	ND	7.2	1.3	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
Pyrene	ND	7.2	2.5	ug/L	1	12/20/19	WB	E625.1/E625.1SIM
QA/QC Surrogates								
% 2,4,6-Tribromophenol	65			%	1	12/20/19	WB	15 - 130 %
% 2-Fluorobiphenyl	68			%	1	12/20/19	WB	30 - 130 %
% 2-Fluorophenol	37			%	1	12/20/19	WB	10 - 130 %
% Nitrobenzene-d5	52			%	1	12/20/19	WB	15 - 130 %
% Phenol-d5	24			%	1	12/20/19	WB	10 - 130 %
% Terphenyl-d14	77			%	1	12/20/19	WB	30 - 130 %

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level LOD=Limit of Detection
MDL=Method Detection Limit1

QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

Per 1.4.6 of EPA method 8270D, 1,2-Diphenylhydrazine is unstable and readily converts to Azobenzene. Azobenzene is used for the calibration of 1,2-Diphenylhydrazine.

Semi-Volatile Comment:

Poor surrogate recovery was observed for one acid and/or one base surrogate. The other surrogates associated with this sample were within QA/QC criteria. No significant bias suspected.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director

December 24, 2019

Reviewed and Released by: Greg Lawrence, Assistant Lab Director



APPENDIX C:

**METHOD 3 RISK CHARACTERIZATION – DEP
SHORTFORMS**

DRAFT

**Method 3 Risk Characterization
(Short Form)
RTN 3-36184**

515 Somerville Avenue; Somerville

**Resident - Soil: Table RS-1
Exposure Point Concentration (EPC)**

Based on Resident Ages 1-31 (Cancer), 1-8 (Chronic Noncancer), and 1-2 (Subchronic Noncancer)

ShortForm Version 10-12

Vlookup Version v0414

Do not insert or delete any rows

Click on empty cell below and select OHM using arrow.

ELCR (all chemicals) = 1.0E-06

Chronic HI (all chemicals) = 3.1E-01

Subchronic HI (all chemicals) = 1.7E-01

Oil or Hazardous Material	EPC (mg/kg)	ELCR _{ingestion}	ELCR _{dermal}	Derm & Ing ELCR _{total}	Chronic		Derm & Ing HQ _{total}	Subchronic		Derm & Ing HQ _{total}
					HQ _{ing}	HQ _{derm}		HQ _{ing}	HQ _{derm}	
POLYCHLORINATED BIPHENYLS (PCBs)	6.6E-01	4.9E-07	5.1E-07	1.0E-06	8.0E-02	6.8E-02	1.5E-01	8.8E-02	5.1E-02	1.4E-01
AROMATICS C9 to C10	2.9E+02				2.3E-02	4.0E-02	6.3E-02	6.4E-03	7.5E-03	1.4E-02
ALIPHATICS C5 to C8	1.5E+01				8.9E-04	1.5E-03	2.4E-03	2.4E-04	2.9E-04	5.3E-04
ALIPHATICS C9 to C12	1.4E+03				3.5E-02	6.0E-02	9.5E-02	9.7E-03	1.1E-02	2.1E-02

DRAFT

**Method 3 Risk Characterization
(Short Form)
RTN 3-36184**

515 Somerville Avenue; Somerville

Resident - Soil: Table RS-2

Exposure Point Concentration (EPC)

Based on Resident Ages 1-31 (Cancer), 1-8 (Chronic Noncancer), and 1-2 (Subchronic Noncancer)

*Vegetable uptake is informational only and NOT included in totals on EPC tab.

Do not insert or delete any rows

Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC (mg/kg)	Chronic		Subchronic
		ELCR _{vegetable*}	HQ _{vegetable*}	HQ _{vegetable*}
POLYCHLORINATED BIPHENYLS (PCBs)	6.6E-01	2.3E-04	2.0E+01	1.1E+01
AROMATICS C9 to C10	2.9E+02			
ALIPHATICS C5 to C8	1.5E+01			
ALIPHATICS C9 to C12	1.4E+03			

Vlookup Ver

ELCR (all chemicals) = 2E-04

Chronic HI (all chemicals) = 2E+01

Subchronic HI (all chemicals) = 1E+01

**Method 3 Risk Characterization
(Short Form)
RTN 3-36184**

515 Somerville Avenue; Somerville

**Resident - Soil: Table RS-3
Equations to Calculate Cancer Risk for Resident (Age 1-31 years)**

Cancer Risk from Ingestion

$$\text{ELCR}_{\text{ing}} = \text{LADD}_{\text{ing}(1-31)} * \text{CSF}$$

$$\text{LADD}_{\text{ing}(1-31)} = \text{LADD}_{\text{ing}(1-8)} + \text{LADD}_{\text{ing}(8-15)} + \text{LADD}_{\text{ing}(15-31)}$$

$$\text{LADD}_{\text{ing}(\text{age group } x)} = \frac{[\text{OHM}]_{\text{soil}} * \text{IR}_x * \text{RAF}_{\text{c-ing}} * \text{EF}_{\text{ing}} * \text{ED} * \text{EP}_x * \text{C}}{\text{BW}_x * \text{AP}_{\text{lifetime}}}$$

Cancer Risk from Dermal Absorption

$$\text{ELCR}_{\text{derm}} = \text{LADD}_{\text{derm}} * \text{CSF}$$

$$\text{LADD}_{\text{derm}(1-31)} = \text{LADD}_{\text{derm}(1-8)} + \text{LADD}_{\text{derm}(8-15)} + \text{LADD}_{\text{derm}(15-31)}$$

$$\text{LADD}_{\text{derm}(\text{age group } x)} = \frac{[\text{OHM}]_{\text{soil}} * \text{SA}_x * \text{RAF}_{\text{c-derm}} * \text{SAF}_x * \text{EF}_{\text{derm}} * \text{ED} * \text{EP}_x * \text{C}}{\text{BW}_x * \text{AP}_{\text{lifetime}}}$$

Cancer Risk from Homegrown Produce

$$\text{ELCR}_{\text{produce}} = \text{LADD}_{\text{produce}(1-31)} * \text{CSF}$$

$$\text{LADD}_{\text{produce}(1-31)} = \text{LADD}_{\text{produce}(1-8)} + \text{LADD}_{\text{produce}(8-15)} + \text{LADD}_{\text{produce}(15-31)}$$

$$\text{LADD}_{\text{produce}(\text{age } x)} = \frac{[\text{OHM}]_{\text{soil}} * \text{PUF} * \text{PIR}_x * \text{RAF}_{\text{produce}} * \text{EF}_{\text{produce}} * \text{ED} * \text{EP}_x * \text{C}}{\text{BW}_x * \text{AP}_{\text{lifetime}}}$$

Vlookup Version v0414

Parameter	Value	Units
CSF	OHM specific	(mg/kg-day) ⁻¹
LADD	age/OHM specific	mg/kg-day
[OHM] _{soil}	OHM specific	mg/kg
IR ₍₁₋₈₎	100	mg/day
IR ₍₈₋₁₅₎	50	mg/day
IR ₍₁₅₋₃₁₎	50	mg/day
PIR ₍₁₋₈₎	12,099	mg/day
PIR ₍₈₋₁₅₎	17,809	mg/day
PIR ₍₁₅₋₃₁₎	24,420	mg/day
RAF _{c-ing}	OHM specific	dimensionless
RAF _{c-derm}	OHM specific	dimensionless
RAF _{c-produce}	OHM specific	dimensionless
EF _{ing,derm}	0.412	event/day
EF _{produce}	1.00	event/day
ED	1	day/event
EP ₍₁₋₈₎	7	years
EP ₍₈₋₁₅₎	7	years
EP ₍₁₅₋₃₁₎	16	years
C	0.000001	kg/mg
BW ₍₁₋₈₎	17.0	kg
BW ₍₈₋₁₅₎	39.9	kg
BW ₍₁₅₋₃₁₎	58.7	kg
AP _(lifetime)	70	years
SA ₍₁₋₈₎	2431	cm ² / day
SA ₍₈₋₁₅₎	4427	cm ² / day
SA ₍₁₅₋₃₁₎	5653	cm ² / day
SAF ₍₁₋₈₎	0.35	mg/cm ²
SAF ₍₈₋₁₅₎	0.14	mg/cm ²
SAF ₍₁₅₋₃₁₎	0.13	mg/cm ²
PUF	OHM specific	(mg/mg)(mg/mg) ⁻¹

**Method 3 Risk Characterization
(Short Form)
RTN 3-36184**

515 Somerville Avenue, Somerville

**Resident - Soil: Table RS-4
Equations to Calculate Chronic Noncancer Risk for Resident Child (Age 1-8 years)**

Vlookup Version v0414

Chronic Noncancer Risk from Ingestion

$$HQ_{ing} = \frac{ADD_{ing}}{RfD}$$

$$ADD_{ing} = \frac{[OHM]_{soil} * IR * RAF_{nc-ing} * EF_{ing} * ED * EP * C}{BW * AP}$$

Chronic Noncancer Risk from Dermal Absorption

$$HQ_{derm} = \frac{ADD_{ing,derm}}{RfD}$$

$$ADD_{derm} = \frac{[OHM]_{soil} * SA * RAF_{nc-derm} * SAF * EF_{derm} * ED * EP * C}{BW * AP}$$

Chronic Noncancer Risk from Homegrown Produce

$$HQ_{produce} = \frac{ADD_{produce}}{RfD}$$

$$ADD_{produce} = \frac{[OHM]_{soil} * PUF * PIR * RAF_{produce} * EF_{produce} * ED * EP * C}{BW * AP}$$

Parameter	Value	Units
RfD	OHM specific	mg/kg-day
ADD	OHM specific	mg/kg-day
[OHM] _{soil}	OHM specific	mg/kg
IR	100	mg/day
PIR	12,099	mg/day
RAF _{nc-ing}	OHM specific	dimensionless
RAF _{nc-derm}	OHM specific	dimensionless
RAF _{nc-produce}	OHM specific	dimensionless
EF _{ing,derm}	0.412	event/day
EF _{produce}	1.00	event/day
ED	1	day/event
EP	7	years
C	0.000001	kg/mg
BW	17.0	kg
AP	7	year
SA	2431	cm ² / day
SAF	0.35	mg/cm ²
PUF	OHM specific	(mg/mg)(mg/mg) ⁻¹

**Method 3 Risk Characterization
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515 Somerville Avenue, Somerville

**Resident - Soil: Table RS-5
Equations to Calculate Subchronic Noncancer Risk for Resident Child (Age 1-2 years)**

Vlookup Version v0414

Subchronic Noncancer Risk from Ingestion

$$HQ_{ing} = \frac{ADD_{ing}}{RfD_{subchronic}}$$

$$ADD_{ing} = \frac{[OHM]_{soil} * IR * RAF_{nc-ing} * EF_{ing} * ED * EP * C}{BW * AP}$$

Subchronic Noncancer Risk from Dermal Absorption

$$HQ_{derm} = \frac{ADD_{derm}}{RfD_{subchronic}}$$

$$ADD_{derm} = \frac{[OHM]_{soil} * SA * RAF_{nc-derm} * SAF * EF_{derm} * ED * EP * C}{BW * AP}$$

Subchronic Noncancer Risk from Homegrown Produce

$$HQ_{produce} = \frac{ADD_{produce}}{RfD_{subchronic}}$$

$$ADD_{produce} = \frac{[OHM]_{soil} * PUF * PIR * RAF_{produce} * EF_{produce} * ED * EP * C}{BW * AP}$$

Parameter	Value	Units
RfD	OHM specific	mg/kg-day
ADD	OHM specific	mg/kg-day
[OHM] _{soil}	OHM specific	mg/kg
IR	100	mg/day
PIR	10,900	mg/day
RAF _{nc-ing}	OHM specific	dimensionless
RAF _{nc-derm}	OHM specific	dimensionless
RAF _{nc-produce}	OHM specific	dimensionless
EF _{ing,derm}	0.714	event/day
EF _{produce}	1.00	event/day
ED	1	day/event
EP	0.577	years
C	0.000001	kg/mg
BW	10.7	kg
AP	0.577	year
SA	1670	cm ² / day
SAF	0.35	mg/cm ²
PUF	OHM specific	(mg/mg)(mg/mg) ⁻¹

**Method 3 Risk Characterization
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Vlookup Version v0414

**Resident - Soil: Table RS-6
Definitions and Exposure Factors**

Parameter	Value	Units	Notes
ELCR - Excess Lifetime Cancer Risk	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal, inh=inhalation)
CSF - Cancer Slope Factor	chemical specific	(mg/kg-day) ⁻¹	see Table RS-7
LADD - Lifetime Average Daily Dose	chemical specific	mg/kg-day	Pathway specific
LADE - Lifetime Average Daily Exposure	chemical specific	µg/m ³	
HQ - Hazard Quotient	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal, inh=inhalation)
RfD - Reference Dose	chemical specific	mg/kg-day	see Table RS-7
ADD - Average Daily Dose	chemical specific	mg/kg-day	Pathway specific
ADE - Average Daily Exposure	chemical specific	mg/m ³	
EPC - Exposure Point Concentration	chemical specific	mg/kg	
PUF - Plant Uptake Factor	chemical specific	(mg/mg)/(mg/mg) ⁻¹	See Table RS-7; (mg _{CHM} /mg _{plant})/(mg _{CHM} /mg _{soil}) ⁻¹
IR ₍₁₋₂₎ - Soil Ingestion Rate for age group 1-2	100	mg/day	MADEP. 2002. Technical Update: Calculation of an Enhanced Soil Ingestion Rate. (http://www.mass.gov/dep/ors/orspubs.htm)
IR ₍₁₋₈₎ - Soil Ingestion Rate for age group 1-8	100	mg/day	Ibid
IR ₍₈₋₁₅₎ - Soil Ingestion Rate for age group 8-15	50	mg/day	Ibid
IR ₍₁₅₋₃₁₎ - Soil Ingestion Rate for age group 15-31	50	mg/day	Ibid
PIR ₍₁₋₂₎ = Produce Ingestion Rate for age group 1-2	10,900	mg/day	see Table RS-6
PIR ₍₁₋₈₎ = Produce Ingestion Rate for age group 1-8	12,099	mg/day	see Table RS-6
PIR ₍₈₋₁₅₎ = Produce Ingestion Rate for age group 8-15	17,809	mg/day	Ibid
PIR ₍₁₅₋₃₁₎ = Produce Ingestion Rate for age group 15-31	24,420	mg/day	Ibid
RAF _c - Relative Absorption Factor for Cancer Effects	chemical specific	dimensionless	
EF _{subchronic} - Exposure Frequency for subchronic ingestion or dermal exposure	0.714	event/day	5 days/week
EF _{chronic} - Exposure Frequency for chronic ingestion or dermal exposure	0.412	event/day	5 days/week, 30 weeks/year
EF _{cancer} - Exposure Frequency for cancer, ingestion or dermal exposure	0.412	event/day	5 days/week, 30 weeks/year
EF _{produce} - Exposure Frequency for produce ingestion, cancer and noncancer	1.00	event/day	
ED - Exposure Duration	1	day/event	
EP ₍₁₋₂₎ - Exposure Period for age group 1-2	0.577	years	30 weeks
EP ₍₁₋₈₎ - Exposure Period for age group 1-8	7	years	
EP ₍₈₋₁₅₎ - Exposure Period for age group 8-15	7	years	
EP ₍₁₅₋₃₁₎ - Exposure Period for age group 15-31	16	years	
BW ₍₁₋₂₎ - Body Weight for age group 1-2	10.7	kg	U.S. EPA. 1997. Exposure Factors Handbook. Table 7-7, females.
BW ₍₁₋₈₎ - Body Weight for age group 1-8	17.0	kg	Ibid
BW ₍₈₋₁₅₎ - Body Weight for age group 8-15	39.9	kg	Ibid
BW ₍₁₅₋₃₁₎ - Body Weight for age group 15-31	58.7	kg	Ibid
AP _{subchronic} - Averaging Period for subchronic noncancer	0.577	years	30 weeks
AP _{chronic} - Averaging Period for chronic noncancer	7	years	
AP _{cancer} - Averaging Period for lifetime	70	years	
SA ₍₁₋₂₎ - Surface Area for age group 1-2	1670	cm ² / day	50th percentile of face (1/3 head), forearms, hands, lower legs, and feet for females MADEP. 1995. Guidance for Disposal Site Risk Characterization. Appendix Table B-2.
SA ₍₁₋₈₎ - Surface Area for age group 1-8	2431	cm ² / day	Ibid
SA ₍₈₋₁₅₎ - Surface Area for age group 8-15	4427	cm ² / day	Ibid
SA ₍₁₅₋₃₁₎ - Surface Area for age group 15-31	5653	cm ² / day	Ibid
SAF ₍₁₋₂₎ - Surface Adherence Factor for age group 1-2	0.35	mg/cm ²	All SAFs developed for ShortForm according to procedure outlined in MA DEP Technical
SAF ₍₁₋₈₎ - Surface Adherence Factor for age group 1-8	0.35	mg/cm ²	Update:Weighted Skin-Soil Adherence Factors, April 2002
SAF ₍₈₋₁₅₎ - Surface Adherence Factor for age group 8-15	0.14	mg/cm ²	
SAF ₍₁₅₋₃₁₎ - Surface Adherence Factor for age group 15-31	0.13	mg/cm ²	

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**Resident - Soil: Table RS-7
Homegrown Produce Ingestion Rate**

Vlookup Version v0414

Data on mean produce ingestion rates (wet weight, ww) in the Northeast was obtained from the 1994-1996 Continuing Survey of Food Intakes by Individuals (USDA). Data for both genders were used for children under 6, while data for males was used for individuals 6 and older. The mean ingestion rates presented in the survey represent the arithmetic average of all individuals surveyed, regardless of whether or not they had consumed the produce item (e.g., an individual that did not consume the produce item was assigned a rate of 0 g/day). To determine the mean ingestion rate for individuals who ate each produce item, the ingestion rate for all individuals (consumers and nonconsumers) was divided by the percentage of individuals who ate the item (Table RS-7A). These mean ingestion rates for the produce consumers were summed to determine the total produce ingestion rate for each age-group and converted to dry weight assuming the produce items were all 90% water.

To convert mean ingestion rates for the age-groups studied in the survey to age-groups used in risk calculations, each age-group ingestion rate from the survey (i.e., 1 - 2 year olds, 3 - 5 year olds, 6 - 11 year olds, 12 - 19 year olds, and 20 - 39 year olds) was weighted according to the number of years spent in the risk calculation age group (i.e., 1 - 8 year olds, 8 - 15 year olds, and 15 - 31 year olds) (Table RS-7B). It was assumed that 25% of produce ingested was home-grown (Table RS-7C).

Table RS-7

Age-groups studied in survey	White Potatoes			Dark-green vegetables			Deep-yellow vegetables		
	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)
1-2	28	40.3	69.5	6	10.1	59.4	5	12.7	39.4
3-5	30	37.1	80.9	5	6.5	76.9	7	12.7	55.1
6-11	47	44.2	106.3	6	9.1	65.9	2	8.5	23.5
12-19	59	40.3	146.4	2	2.3	87.0	11	15.8	69.6
20-39	76	45.1	168.5	25	14.7	170.1	4	5.7	70.2

Age-groups studied in survey	Tomatoes			Lettuce			Green Beans		
	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)
1-2	10	27.9	35.8	1	6	16.7	7	12.1	57.9
3-5	10	37.1	27.0	4	14	28.6	3	5.7	52.6
6-11	20	42	47.6	8	14.9	53.7	1	2	50.0
12-19	29	45.2	64.2	19	28.7	66.2	2	2.4	83.3
20-39	48	50.9	94.3	18	29.6	60.8	4	3.7	108.1

Table RS-7a (continued)

Age-groups studied in survey	Corn, Green peas, Lima beans			Melons, berries			Totals Wet Weight WWI	Totals Dry Weight DWI
	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	Ingestion Rate for All g/d (ww)	% of individuals that consumed item.	Ingestion Rate for Consumers g/d (ww)	g/day	g/day
1-2	12	15	80.0	7	9	77.8	436.4	43.6
3-5	14	21.7	64.5	14	11.6	120.7	506.3	50.6
6-11	9	13.6	66.2	5	5.9	84.7	498.0	49.8
12-19	14	9.9	141.4	17	5	340.0	998.1	99.8
20-39	12	7.3	164.4	6	4.5	133.3	969.7	97.0

Table RS-7B

Age-groups studied in survey	Years spent in age-group 1-8 year old	Years spent in age-group 8-15 year old	Years spent in age-group 15-31 year old
1-2	2		
3-5	3		
6-11	2	4	
12-19		3	4
20-39			12
	7	7	16

Table RS-7C

	Produce Intake, dry weight			
	Child 1-2 years g/day	Child 1-8 years g/day	Child 8-15 years g/day	Adult 15-31 g/day
All Produce:	43.6	48.4	71.2	97.7
Homegrown:	10.9	12.1	17.8	24.4

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**Resident - Soil: Table RS-8
Chemical-Specific Data**

Vlookup Version v0414

Oil or Hazardous Material	CSF (mg/kg-day) ⁻¹	RAF _{c-ing}	RAF _{c-derm}	RAF _{c-prod}	Chronic RfD mg/kg-day	Subchronic RfD mg/kg-day	Chronic RAF _{nc-ing}	Chronic RAF _{nc-derm}	Subchronic RAF _{nc-ing}	Subchronic RAF _{nc-derm}	RAF _{nc-prod}	PUF
POLYCHLORINATED B	2.0E+00	1.00	0.10	1.00	2.0E-05	5.0E-05	1	0.1	1	0.1	1	0.84
AROMATICS C9 to					3.0E-02	3.0E-01	1	0.2	1	0.2		
ALIPHATICS C5 to					4.0E-02	4.0E-01	1	0.2	1	0.2		
ALIPHATICS C9 to					1.0E-01	1.0E+00	1	0.2	1	0.2		

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**Construction Worker - Soil: Table CW-1
Exposure Point Concentration (EPC) and Risk
Based on Construction Worker 18-25 years of age**

ShortForm Version 10-12

Vlookup Version v0315

****Do not insert or delete any rows****

Click on empty cell below and select OHM using arrow.

ELCR (all chemicals) = 2.3E-08

HI (all chemicals) = 4.4E-02

Oil or Hazardous		EPC	ELCR	ELCR	ELCR	ELCR	ELCR _{total}	Subchronic				HQ _{total}
Material (OHM)		(mg/kg)	ingestion	dermal	inhalation GI	inhalation pulmonary		HQ _{ing}	HQ _{derm}	HQ _{inh-GI}	HQ _{inh}	
POLYCHLORINATED BIPHENYLS (PCBs)		6.6E-01	1.1E-08	1.2E-08	3.0E-10	1.7E-11	2.3E-08	1.6E-02	1.6E-02	4.2E-04	1.2E-03	3.4E-02
AROMATICS	C9 to C10	2.9E+02						1.2E-03	2.4E-03	3.1E-05	2.2E-05	3.6E-03
ALIPHATICS	C5 to C8	1.5E+01						4.5E-05	9.1E-05	1.2E-06	2.7E-06	1.4E-04
ALIPHATICS	C9 to C12	1.4E+03						1.8E-03	3.6E-03	4.6E-05	9.0E-05	5.5E-03

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Vlookup Version v0315

Construction Worker - Soil: Table CW-2
Equations to Calculate Cancer Risk for Construction Worker

Cancer Risk from Ingestion

$$ELCR_{ing} = LADD_{ing} * CSF_{oral}$$

$$LADD_{ing} = \frac{EPC * IR * RAF_{c-ing} * EF * ED_{ing} * EP * C1}{BW * AP_{lifetime}}$$

Cancer Risk from Dermal Absorption

$$ELCR_{derm} = LADD_{derm} * CSF_{oral}$$

$$LADD_{derm} = \frac{EPC * SA * AF * RAF_{c-derm} * EF * ED_{derm} * EP * C1}{BW * AP_{lifetime}}$$

Cancer Risk from Particulate Inhalation - Gastrointestinal Absorption

$$ELCR_{inh-GI} = LADD_{inh-GI} * CSF_{oral}$$

$$LADD_{inh-GI} = \frac{EPC * RCAF_{inh-gi} * PM_{10} * VR_{work} * RAF_{c-ing} * EF * ED_{inh} * EP * C2 * C3 * C4}{BW * AP_{lifetime}}$$

Cancer Risk from Particulate Inhalation - Pulmonary Absorption

$$ELCR_{inh} = LADD_{inh} * CSF_{inhalation}$$

$$LADD = \frac{EPC * RCAF_{inh} * PM_{10} * VR_{work} * RAF_{c-inh} * EF * ED_{inh} * EP * C2 * C3 * C4}{BW * AP_{lifetime}}$$

Parameter	Value	Units
CSF	OHM-specific	(mg/kg-day) ⁻¹
LADD	age/OHM-specific	mg/kg-day
EPC	OHM-specific	mg/kg
IR	100	mg/day
RAF _{c-ing}	OHM-specific	dimensionless
RAF _{c-derm}	OHM-specific	dimensionless
RAF _{c-inh}	OHM-specific	dimensionless
EF	0.714	event/day
ED _{ing & derm}	1	day/event
ED _{inh}	0.333	day/event
EP	180	days
C1	1.0E-06	kg/mg
C2	1.0E-09	kg/μg
C3	1440	min/days
C4	1.0E-03	m ³ /L
BW	58.0	kg
AP _(lifetime)	25,550	days
VR _{work}	60	L/min
AF	0.29	mg/cm ²
SA	3473	cm ² /day
RCAF _{inh-gi}	1.5	dimensionless
RCAF _{inh}	0.5	dimensionless
PM ₁₀	60	μg/m ³

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**Construction Worker - Soil: Table CW-3
Equations to Calculate Noncancer Risk for Construction Worker**

Vlookup Version v0315

Noncancer Risk from Ingestion

$$HQ_{ing} = \frac{ADD_{ing}}{RfD_{oral-subchronic}}$$

$$ADD_{ing} = \frac{EPC * IR * RAF_{nc-ing} * EF * ED_{ing} * EP * C1}{BW * AP_{noncancer}}$$

Noncancer Risk from Dermal Absorption

$$HQ_{derm} = \frac{ADD_{derm}}{RfD_{oral-subchronic}}$$

$$ADD_{dermal} = \frac{EPC * SA * AF * RAF_{nc-derm} * EF * ED_{dermal} * EP * C1}{BW * AP_{noncancer}}$$

Noncancer Risk from Particulate Inhalation - Gastrointestinal Absorption

$$HQ_{inh-GI} = \frac{ADD_{inh-GI}}{RfD_{oral-subchronic}}$$

$$ADD_{inh-GI} = \frac{EPC * RCAF_{inh-gi} * PM_{10} * VR_{work} * RAF_{nc-ing} * EF * ED_{inh} * EP * C2 * C3 * C4}{BW * AP_{noncancer}}$$

Noncancer Risk from Particulate Inhalation - Pulmonary Absorption

$$HQ_{inh} = \frac{ADD}{RfD_{inhalation-subchronic}}$$

$$ADD_{inh} = \frac{EPC_{soil} * RCAF_{inh} * PM_{10} * VR_{work} * RAF_{nc-inh} * EF * ED_{inh} * EP * C2 * C3 * C4}{BW * AP_{noncancer}}$$

Parameter	Value	Units
RfD	OHM-specific	mg/kg-day
ADD	OHM-specific	mg/kg-day
EPC	OHM-specific	mg/kg
IR	100	mg/day
RAF _{nc-ing}	OHM-specific	dimensionless
RAF _{nc-derm}	OHM-specific	dimensionless
RAF _{nc-inh}	OHM-specific	dimensionless
EF	0.714	event/day
ED _{ing & derm}	1	day/event
ED _{inh}	0.333	day/event
EP	180	days
C1	1.0E-06	kg/mg
C2	1.0E-09	kg/μg
C3	1440	min/days
C4	1.0E-03	m ³ /L
BW	58.0	kg
AP _{noncancer}	180	days
VR _{work}	60	L/min
AF	0.29	mg/cm ²
SA	3473	cm ² /day
RCAF _{inh-gi}	1.5	dimensionless
RCAF _{inh}	0.5	dimensionless
PM10	60	μg/m ³

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**Construction Worker - Soil: Table CW-4
Definitions and Exposure Factors**

Vlookup Version v0315

Parameter	Value	Units	Notes
ELCR - Excess Lifetime Cancer Risk	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal, inh=inhalation)
HI - Hazard Index	chemical specific	dimensionless	Pathway specific (ing =ingestion, derm=dermal, inh=inhalation)
CSF - Cancer Slope Factor	chemical specific	(mg/kg-day) ⁻¹	see Table CW-5.
RfD - Reference Dose	chemical specific	mg/kg-day	see Table CW-5.
LADD - Lifetime Average Daily Dose	chemical specific	mg/kg-day	Pathway specific. See Table CW-2.
ADD - Average Daily Dose	chemical specific	mg/kg-day	Pathway specific. See Table CW-3.
EPC - Exposure Point Concentration	chemical specific	mg/kg	see Table CW-1.
IR - Soil Ingestion Rate	100	mg/day	MADEP. 2002. Technical Update: Calculation of an Enhanced Soil Ingestion Rate. (http://www.mass.gov/dep/ors/orspubs.htm).
RAF _c - Relative Absorption Factor for Cancer Effects	chemical specific	dimensionless	Pathway specific - see Table CW-5.
RAF _{nc} - Relative Absorption Factor for Noncancer Effects	chemical specific	dimensionless	Pathway specific - see Table CW-5.
EF - Exposure Frequency	0.714	event/day	5 events (days) / 7 events (days) in a week; MADEP 1995 Guidance for Disposal Site Risk Characterization pg B-38.
ED _{ing,derm} - Exposure Duration for ingestion or dermal exposure	1	day/event	
ED _{inh} - Exposure Duration for inhalation exposure	0.333	day/event	Represents 8 hours / event.
EP - Exposure Period	180	days	6 months; MADEP 1995 Guidance for Disposal Site Risk Characterization.
BW - Body Weight	58.0	kg	U.S. EPA. 1997. Exposure Factors Handbook. Table 7-7, Females, ages 18 - 25.
AP _(lifetime) - Averaging Period for lifetime	25,550	days	Represents 70 years
AP _(noncancer) - Averaging Period for noncancer	180	days	6 months; MADEP 1995 Guidance for Disposal Site Risk Characterization.
AF - Adherence Factor	0.29	mg/cm ²	MA DEP. 2002 Technical Update: Weighted Skin-Soil Adherence Factors. (http://www.mass.gov/dep/ors/orspubs.htm)
VR _{work} - Ventilation Rate during work (heavy exertion)	60	L/min	Table B-4 MADEP 1995 Guidance for Disposal Site Risk Characterization.
SA - Surface Area	3473	cm ² /day	MADEP. 1995. Guidance for Disposal Site Risk Characterization. 50th percentile for females. Appendix Table B-2.
IFAF _{inh-gi} - Ingestion Fraction Adjustment Factor, gastrointestinal	1.5	dimensionless	MADEP 2007. Characterization of Risks Due to Inhalation of Particulates by Construction Workers
IFAF _{inh} - Inhalation Fraction Adjustment Factor, inhalation	0.5	dimensionless	MADEP 2002. Characterization of Risks Due to Inhalation of Particulates by Construction Workers
PM10 - Concentration of PM ₁₀	60	µg/m ³	MADEP 1995 Guidance for Disposal Site Risk Characterization pg B-11

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**Construction Worker - Soil: Table CW-5
Chemical-Specific Data**

Vlookup Version v0315

Oil or Hazardous Material	Oral CSF (mg/kg-day) ⁻¹	RAF _{c-ing}	RAF _{c-derm}	RAF _{c-inh}	Inhalation CSF (mg/kg-day) ⁻¹	Subchronic Oral RfD mg/kg-day	Subchronic RAF _{nc-ing}	Subchronic RAF _{nc-derm}	Subchronic RAF _{nc-inh}	Subchronic Inhalation RfD
POLYCHLORINATED BIPHENYLS (PCBs)	2.0E+00	1	0.1	1	3.5E-01	5.0E-05	1	0.1	1	5.7E-06
AROMATICS C9 to C10						3.0E-01	1	0.2	1	1.4E-01
ALIPHATICS C5 to C8						4.0E-01	1	0.2	1	5.7E-02
ALIPHATICS C9 to C12						1.0E+00	1	0.2	1	1.7E-01

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APPENDIX D:
GARDENING BEST MANAGEMENT PRACTICES

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Best Management Practices for Non-commercial Gardening at Disposal Sites

This property is part of a disposal site that has been assessed and determined to meet the requirements of a Permanent Solution with Conditions under the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000, where the Conditions include the recommendation of Best Management Practices (“BMPs”) for gardening to reduce the potential risks from exposure to contaminated soil that remains on the site.

While the property has been determined to be safe for unrestricted use, including residential use, there are residual levels of contaminants remaining in the soil. Gardeners should consider implementing BMPs to further reduce potential exposure to material in the soil, regardless of the contaminant levels remaining. Implementing BMPs such as those suggested below will allow safer gardening in a wider range of site conditions. Not every BMP is necessary for every single site, but a combination of BMPs appropriate for your particular site will help reduce the potential for additional exposure.

Construct Physical Controls and Improve Soil Conditions

Actions to minimize contact (covering the soil) and reduce contaminant levels (such as amending the soil) will further reduce potential risks. Many good gardening practices, like adding compost and soil amendments, improve the soil while reducing the amount of contaminants and exposure to them. Recommendations include:

- Build your garden away from areas known or suspected to be contaminated. In addition to areas where residual contamination may be present, as identified by the disposal site assessment, other sources of contamination can include painted structures (particularly older buildings that may have been painted with lead paint), roads and rail lines.
- Build a hedge or fence to reduce windblown contamination from mobile sources and busy streets.
- Cover existing soil and walkways with mulch, landscape fabric, stones, or bricks.
- Use mulch in your garden beds to reduce dust and soil splash back, reduce weed establishment, regulate soil temperature and moisture, and add organic matter.
- Use soil amendments (such as lime and compost) to maintain neutral pH and add organic matter to improve soil structure.
 - Not all amendments are the same; be sure to choose the right amendments for your soil - amendments that improve conditions at one garden may not work well in others.
 - Keep in mind that each amendment type will have different application amounts and techniques (e.g., rototilling), and may need to be maintained and reapplied (e.g., annually).

- Be sure to work with your local or state regulatory agency, and ask if your municipality provides free compost or mulch. Obtain compost only from a reputable source that can provide information regarding the quality and type of feedstock used to generate the compost.
- Add topsoil or clean fill from a reputable source that can provide information regarding the quality of the topsoil or fill to ensure the soil is safe for handling by children or gardeners of all ages and for food production.
- Build raised beds or container gardens.
 - Raised beds can be made by simply mounding soil into windrows or by building containers.
 - Raised beds help improve water drainage in heavy clay soils or low-lying areas. They also create accessible gardening locations for many users and allow for more precise soil management.
 - Foot traffic should not be necessary in the bed, so the soil does not become compacted and soil preparation in the coming years is minimized.
 - Place a water permeable fabric cover or geotextile as the bottom layer of your raised bed to further reduce exposure to soils of concern.
 - Sided beds can be made from wood, synthetic wood, stone, concrete block, brick or naturally rot-resistant woods such as cedar and redwood. Avoid using chemical-treated lumber for the raised bed because chemicals used in the treated wood could make their way into the soils and plants.

Minimize Ongoing Contact with or Ingestion of Soil

Actions to further reduce contact with soil during and after gardening activities can also minimize potential risks from any contaminants remaining in the soil.

- Do not use plants grown in contaminated soil for compost.
- Work in the garden when soil is moist or damp to minimize creation of dust.
- Avoid “double-digging” to decrease likelihood of moving deep soils to the surface.
- Wear gloves, long sleeves and pants while gardening to prevent skin exposure;
- Remove gardening shoes and garments before entering the home, and wash gardening clothes separately from other clothing.
- Wash hands after gardening.
- Wash all vegetables thoroughly.

For More Information

These recommended BMPs are consistent with federal, state and local guidance on urban gardening in general. MassDEP has additional information available online at: <http://www.Mass.Gov/eea/agencies/massdep/cleanup/regulations/gardening-best-management-practices-at-disposal-sites.html>